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WHAT MAKES THE RICH RICHER AND THE POOR POORER.

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KARL MARX says, "An accumulation of wealth at one pole of society indicates an accumulation of misery and overwork at the other."* In this assertion, Marx avoids the very common and mischievous fallacy of confusing causes, consequences, and symptoms. He suggests that what is found at one pole indicates, or is a symptom of, what may be found at the other. In the development of his criticisms on political economy and the existing organization of society, however, Marx proceeds as if there were a relation of cause and effect in the proposition just quoted, and his followers and popularisers have assumed as an indisputable postulate that the wealth of some is a cause of the poverty of others. The question of priority or originality as between Marx, Rodbertus, and others, is at best one of vanity between them and their disciples,† but it is of great interest and importance to notice that the doctrine that wealth at one pole makes misery at the other is the correct logical form of the notion that progress and poverty are correlative. This doctrine rests upon another and still more fundamental one, which is not often formulated, but which can be detected in most of the current socialistic discussions, viz., that all the capital which is here now would be here under any laws or institutions about property, as if it were due to some independent cause, and that some have got ahead of others and seized upon the most of it, so that those who came later have not been able to get any. If this notion about the source of capital is not true, then wealth at one pole can not cause poverty at the other. If it is

* "Das Capital," i, 671.

† On this question see Anton Menger, "Das Recht auf den vollen Arbeitsertrag," Stuttgart, 1886. This writer traces back for a century the fundamental socialistic notions. He aims to develop the jural as distinguished from the economic aspect of socialism.

true, then we can make any regulations we like about the distribution of wealth, without fear lest the measures which we adopt may prevent any wealth from being produced.

In Rome, under the empire, wealth at one pole was a symptom of misery at the other, because Rome was not an industrial state. Its income came from plunder. The wealth had a source independent of the production of the society of Rome. That part of the booty which some got, others could not have. No such thing is true of an industrial society. The wealth of the commercial cities of Italy and Southern Germany, in the middle ages, was largely in the hands of merchant-princes. If one were told that some of these merchants were very rich, he would have no ground of inference that others in those cities must have been poor. The rich were those who developed the opportunities of commerce which were, in the first instance, open to all. What they gained came out of nothing which anybody else ever had or would have had. The fact that there are wealthy men in England, France, and the United States to-day, is no evidence that there must be poor men here. The riches of the rich are perfectly consistent with a high condition of wealth of all, down to the last. In fact, the aggregations of wealth, both while being made and after realization, develop and sustain the prosperity of all. The forward movement of a strong population, with abundance of land and highly developed command by machinery over the forces of Nature, must produce a state of society in which average and minimum comfort are high, while special aggregations may be enormous, misfortune and vice being left out of account.

Whatever nexus there is between wealth at one pole and poverty at the other can be found only by turning the proposition into its converse—misery at one pole makes wealth at the other. If the mass at one pole should, through any form of industrial vice, fall into misery, they would offer to the few wise an opportunity to become rich by taking advantage of them. They would offer a large supply of labor at low wages, a high demand for capital at high rates of interest, and a fierce demand for land at high rent.

It is often affirmed, and it is true, that competition tends to disperse society over a wide range of unequal conditions. Competition develops all powers that exist according to their measure and degree. The more intense competition is, the more thoroughly are all the forces developed. If, then, there is liberty, the results can not be equal; they must correspond to the forces. Liberty of development and equality of result are therefore diametrically opposed to each other. If a group of men start on equal conditions, and compete in a common enterprise, the results which they attain must differ according to inherited powers, early advantages of training, personal courage, energy, enterprise, perseverance, good sense, etc., etc. Since these things differ through a wide range, and since their combinations

may vary through a wide range, it is possible that the results may vary through a wide scale of degrees. Moreover, the more intense the competition, the greater are the prizes of success and the heavier are the penalties of failure. This is illustrated in the competition of a large city as compared with that of a small one. Competition can no more be done away with than gravitation. Its incidence can be changed. We can adopt as a social policy, "Woe to the successful!" We can take the prizes away from the successful and give them to the unsuccessful. It seems clear that there would soon be no prizes at all, but that inference is not universally accepted. In any event, it is plain that we have not got rid of competition—i. e., of the struggle for existence and the competition of life. We have only decided that, if we can not all have equally, we will all have nothing.

Competition does not guarantee results corresponding with merit, because hereditary conditions and good and bad fortune are always intermingled with merit, but competition secures to merit all the chances it can enjoy under circumstances for which none of one's fellow-men are to blame.

Now, it seems to be believed that although competition produces wide grades of inequality, almsgiving, or forcible repartition of wealth, would not do so. Here we come to the real, great, and mischievous fallacy of the social philosophy which is in vogue. Whether there are great extremes of rich and poor in a society is a matter of very little importance. There is no ground for the importance which is attached to that fact in current discussion. It is constantly affirmed in one form or another that, although one man has, in half a lifetime, greatly improved his own position, and can put his children in a far better condition than that in which he started, nevertheless he has not got his fair share in the gains of civilization, because his neighbor, who started where he did, has become a millionaire. John, who is eating a beefsteak off iron-stone china, finds that the taste of it is spoiled because he knows that James is eating pheasants off gold. William, who would have to walk anyway, finds that his feet ache a great deal worse because he learns that Peter has got a horse. Henry, whose yacht is twenty feet long, is sure that there is something wrong in society because Jacob has one a hundred feet long. These are weaknesses of human nature which have always been the fair game of the satirists, but, in our day, they are made the basis of a new philosophy and of a redistribution of rights and of property. If the laws and institutions of the society hinder any one from fighting out the battle of life on his or her own behalf to the best of one's ability, especially if they so hinder one to the advantage of another, the field of effort for intelligent and fruitful reform is at once marked out; but, if examination should reveal no such operation of laws and institutions, then the inequality of achievements is no indication of any social disease, but the contrary.

The indication of social health or disease is to be sought in quite another fact. The question whether the society is formed of only two classes, the rich and the poor, the strong and the weak, or whether all the intervening grades are represented in a sound and healthy proportion, is a question which has importance, because it furnishes indications of the state and prospects of the society. No society which consists of the two extreme classes only is in a sound and healthy condition.

If we regard the society of a new country, with little government regulation, free institutions, low taxes, and insignificant military duty, as furnishing us with the nearest example of a normal development of human society under civilization, then we must infer that such a society would not consist of two well-defined classes widely separated from each other, but that there would be no well-defined classes at all, although its members might, in their extremest range, be far apart in wealth, education, talent, and virtue. Such a society might, as it grew older, and its population became more dense, develop, under high competition, great extremes of economic power and social condition, but there is no reason to suppose that the whole middle range would not be filled up by the great mass of the population.

I have now cleared the ground for the proposition which it is my special purpose, in this paper, to offer:

It is the tendency of all social burdens to crush out the middle class, and to force the society into an organization of only two classes, one at each social extreme.

It is in the nature of the case impracticable to adjust social burdens proportionately to the power of individuals to support them. If this could be done, it is possible that the burdens might become great, even excessive, without producing the effect which I have stated. Since, however, it is impossible to so adjust them, and they must be laid on "equally" with reference to the unit of service, and not with reference to some unit of capacity to endure them, it follows that the effect must be as stated. So soon as the burden becomes so great that it surpasses the power of some part of the society, a division takes place between those who can and those who can not endure it. At first, those who are close to this line, but just above it, are not far removed from those who are close to it, but just below it; but, as time goes on, and the pressure continues to operate, they are constantly separated from each other by a wider and wider interval.

Let us look at some of the historical facts which show us this law.

If we take the early Roman history as Mommsen relates it to us, we observe the constant recurrence of the difficulty which arose from the tendency of the society toward two extreme classes. It was plainly the pressure of military duty and taxes which was constantly developing two classes, debtors and creditors. The demands of the state fell upon different men in very different severity according to

circumstances.* One found himself just so well established that he could endure without being crushed. Another found that the time demanded, or the wound received, or the loss sustained by an inroad, or by being on an unsuccessful expedition, threw him back so that he fell in debt. The former, securing a foothold and gaining a little, bought a slave and established himself with a greater margin of security. Slavery, of course, mightily helped on the tendency. Twenty years later the second man was the bankrupt debtor and bondman of the first.

All insecurity of property has the same effect, above all, however, when the insecurity is produced by abuse of state power. In the later history of Rome, the Roman power, having conquered the world and dragged thousands born elsewhere into Italy as slaves, set to work to plunder its conquest. The booty taken by emperors, proconsuls, and freedmen favorites, and by the sovereign city, was shared, through the largesses, with the proletariat of the city. The largesses and slavery worked together to divide the Romans into two classes. The plunder of the provinces intensified the wealth of the wealthy. The largesses pauperized and proletarianized the populace of the great city.† They drew away citizens from the country, and from honest industry, to swell the mob of the city. If a band of robbers should split into patricians and plebeians and divide the plunder unequally, it is plain that, as time went on, they must separate into two great factions, one immensely rich, the other miserably poor.‡ As for the victims, although at first the severity and security of Roman law and order were not too dear even at the price which they cost; nevertheless, the inevitable effect of robbery came out at last, and the whole Roman world was impoverished.* Those only could get or retain wealth among the provincials who could gain favor with, or get on the side of, the rulers. No satisfactory exposition of the political economy of the Roman commonwealth has yet been written. The effect of the Roman system on population, on the development of capital in the provinces, on the arts and sciences, on the distribution of the precious metals, on city population at Rome and Constantinople, on the development of talent and genius, offers lessons of profound importance, touching in many points on questions which now occupy us. The Roman Empire was a gigantic experiment in the way of a state which

* As to the heavy burdens of Roman citizenship, see Merivale, viii, 284.

† See Mommsen, book iii, chapters xi, xii; book v, chapter xi; Pöhlmann, "Die Uebervölkerung der antiken Gross-Städte," Leipsic, 1884.

‡ See especially Friedlaender, "Sittengeschichte," i, 22: "In the enjoyment of the extravagant abundance of advantages, excitements, and spectacles, which the metropolis offered, the highest and lowest classes were best off. The great majority of the free male inhabitants were fed partly or entirely at public expense. The great found there an opportunity and means for a royal existence as nowhere else on earth. The middle classes were most exposed to the disadvantages of life at Rome."

* See Merivale, viii, 351; Gibbon, chapter xxxvi, at the end.

took from some to give to others. "At the beginning of the third century already the signs of a fatal loss of vitality manifested themselves with frightful distinctness, and spread with such rapidity that no sagacious observer could deceive himself any longer as to the beginning dissolution of the gigantic body."*

All violence has the same effect. In the fifth and sixth centuries of our era, the general disorder and violence which prevailed gradually brought about a division of society on a line which, of course, wavered for a long time. A man who was strong enough in his circumstances to just maintain himself in such times became a lord. Another, who could not maintain himself, sought safety by becoming the lord's man. As time went on, every retainer whom the former obtained made him seem a better man to be selected as lord; and, as time went on, any man who was weak but independent found his position more and more untenable.†

Taine's history of the revolution shows distinctly that the middle class were the great sufferers by the revolution. Attention has always been arrested by the nobles who were robbed and guillotined. When, however, we get closer to the life of the period, we see that, taking France over for the years of the revolutionary disorder, the victims were those who had anything, from a peasant or a small tradesman up to the well-to-do citizen.‡ The rich bought their way through, and the nobles were replaced by a new gang of social parasites enriched by plunder and extortion. These last come nearer than any others whom history presents to the type of what the "committee" in a socialistic state may be expected to be.*

All almsgiving has the same effect, especially if it is forced by state authority. The Christian Church of the fourth and fifth centuries, by its indiscriminate almsgiving on a large scale, helped on the degeneration of the Roman state.‖ A poor law is only another case. The poor-rates, as they become heavier, at last drive into the workhouses the poorest of those who have hitherto maintained independence and paid poor-rates. With this new burden the chance of the next section upward to maintain themselves is imperiled, and so on indefinitely.

All taxation has the same effect. It presses hardest on those who, under the conditions of their position in life and the demands which are made upon them, are trying to save capital and improve their circumstances. The heavier it becomes, the faster it crushes out this

* Friedlaender, i, preface. While reading the proof of this article, I have read Professor Boccardo's "Manuale di Storia del Comercio, delle Industrie e dell' Economia Politica" (Torino-Napoli, 1886), in which, pp. 74, 75, he expresses the same view as is above given more nearly than I have ever seen it elsewhere.

† See Gibbon, chapter xxxviii; Duruy, "Histoire du Moyen Age," 233, 234; Hallam's "Middle Ages," chapter i, part ii; Seebohm, "The English Village Community," chapter viii.

‡ See vol. iii, book iv, chapter i. * See vol. iii, book iii, chapter iii. ‖ Pöhlmann, 62.

class of persons—that is, all the great middle class—and the greater the barrier it sets up against any efforts of persons of that class to begin accumulation. If the taxes have for their object to take from some and give to others, as is the case with all protective taxes, we have only a more intense and obvious action in the same direction, and one whose effects must be far greater and sooner realized. The effect of protective taxes in this country to drive out the small men, and to throw special lines of industry into the hands of a few large capitalists, has been noted often. It is only a case of the law which I am defining.

My generalization might even be made broader. It is the tendency of all the hardships of life to destroy the middle class. Capital, as it grows larger, takes on new increments with greater and greater ease. It acquires a kind of momentum. The rich man, therefore, can endure the shocks of material calamity and misfortune with less distress the richer he is. A bad season may throw a small farmer into debt from which he can never recover. It may not do more to a large farmer than lessen one year's income. A few years of hard times may drive into bankruptcy a great number of men of small capital, while a man of large capital may tide over the distress and put himself in a position to make great gains when prosperity comes again.

The hardships and calamities which are strictly social are such as come from disorder, violence, insecurity, covetousness, envy, etc. The state has for its function to repress all these. It appears from what I have said that it is hard to maintain a middle class on a high stage of civilization. If the state does not do its work properly, such classes, representing the wide distribution of comfort and well-being, will die out. If the state itself gives license to robbery and spoliation, or enforces almsgiving, it is working to destroy the whole middle class, and to divide society into two great classes, the rich who are growing richer, not by industry, but by spoliation, and the poor who are growing poorer, not by industrial weakness, but by oppression.

Now, a state which is in any degree socialistic is in that degree on the line of policy whose disastrous effects have here been described. The state, it can not too often be repeated, has nothing, and can give nothing, which it does not take from somebody. Its victims must be those who have earned and saved, and they must be the broad, strong middle classes, from whom alone any important contributions can be drawn. They must be impoverished. Its pets, whoever they may be, must be pauperized and proletarianized. Its agents alone—that is, those who, in the name of the state, perform the operation of taking from some to give to others—can become rich, and if ever such a state should be organized, they may realize wealth beyond the dreams of a proconsul.

To people untrained in the study of social forces it may appear the most obvious thing in the world that, if we should confiscate the prop-

erty of those who have more than a determined amount, and divide the proceeds among those who have less than a certain amount, we should strengthen the middle class, and do away with the two extremes. The effect would be exactly the opposite. We should diminish the middle classes and strengthen the extremes. The more we helped at the bottom, the more we should have to help, not only on account of the increase of the population and the influx of eager members of "the house of want," but also on account of the demoralization of the lowest sections of the middle class who were excluded. The more we confiscated at the top, the more craft and fraud would be brought into play to escape confiscation, and the wider must be the scope of taxation over the upper middle classes to obtain the necessary means.

The modern middle class has been developed with, and in, an industrial civilization. In turn they have taken control of this civilization and developed social and civil institutions to accord with it. The organization which they have made is now called, in the cant of a certain school, "capitalism" and a "capitalistic system." It is the first organization of human society that ever has existed based on rights. By virtue of its own institutions, it now puts itself on trial, and stands open to revision and correction whenever, on sober and rational grounds, revision can be shown to be necessary to guarantee the rights of any one. It is the first organization of human society that has ever tolerated dissent or criticism of itself. Nobles and peasants have never made anything but Poland or Russia. The proletariat has never made anything but revolution. The socialistic state holds out no promise that it will ever tolerate dissent. It will never consider the question of reform. It stands already on the same footing as all the old states. It knows that it is right, and *all* right. Of course, therefore, there is no place in it for reform. With extreme reconstructions of society, however, it may not be worth while to trouble ourselves. What we need to perceive is, that all socialistic measures, whatever their degree, have the same tendency and effect. It is they which may be always described as tending to make the rich richer and the poor poorer, and to extinguish the intervening classes.

MISGOVERNMENT OF GREAT CITIES.

By FRANK P. CRANDON.

GREAT cities are essential to the development of any important or influential national life. They gather into themselves the resources of the nation, and so organize its stores of wealth, its enterprise, and the results of its genius and culture, as to render each efficient in promoting the common good. They are the centers of power. Without the facilities which through them are afforded for commerce

and manufactures, without their aggregations of capital, their business systems and institutions, and their fostering care of art, science, and literature, it would seem impossible that there could be any civilization or progress.

These great municipalities are the exponents of the national advancement in material wealth, in commercial importance and influence, and in all forms of intellectual and moral culture. In times past they have been the agencies through which civil and intellectual freedom have been conserved, even if they may not be credited with having been the nursery in which liberty was cradled. They constitute the medium through which we must study many of the most important and interesting phases of history, and are the sources of all the greatest enterprises of the world.

So thoroughly do cities become representative of national life and characteristics, that it is frequently said that London is England, Rome is Italy, and Paris is France. In a less comprehensive but nevertheless very important sense it might properly be said that New York represents America, Boston stands for New England, and Chicago for the great West. A thorough acquaintance with either of these great cities is equivalent to knowing well the people by whom they are surrounded.

Notwithstanding their important relation to all that is significant or influential in national life and history, it is nevertheless true that there has never been developed anything, which even by courtesy, could be called a science of municipal government. Indeed, it is only within these latest years that the fact that there could be such a science has even been suggested. But the pressure has been constantly growing more and more imperious. Monstrosities which are the legitimate fruit of the hap-hazard system, or rather lack of system, which characterizes the government of many cities, evils of administration and burdens of taxation that had become almost unendurable; the astounding frauds which have been brought to light within the last few years in New York and Philadelphia, and the usurpation of power by demagogues through the aid of the most degraded elements of society, have at last forced an inquiry as to what form of municipal government will most efficiently correct present abuses and reduce to the minimum the opportunities for harm to the body politic.

Men begin to ask whether the municipal authority may not be so organized and administered that it shall promote and protect the interests of both the corporation and the individual; whether the evils to which I have alluded, and others equally apparent and subversive of the ends of good government, are inherent in our municipal system or only incident thereto. And some effort has been made to ascertain the principles which underlie a legitimate municipal authority and the most efficient means of making the application of those principles practical.

Not a very great deal has been accomplished by this study. The problem is complicated and many-sided. Its solution depends on careful and extended observation, and on the concurrent action of wise, patient, self-sacrificing, and public-spirited citizens. In this study the conclusions of purely theoretical political economists, and of those men whose thought and experience have been limited to special aspects of the subject, are alike unsafe and misleading: the first, because political communities never afford the proper conditions for the application of abstract principles; and the second, because the entire machinery of government is so interdependent and complicated that successful modifications of any special department imply corresponding changes in all the associated agencies. But whatever difficulties may embarrass the subject, we have good cause for congratulation in the fact that the problem is being studied, and not altogether studied in vain.

The evils growing out of the misgovernment of cities may be grouped in two general divisions: First, those which are the legitimate fruit of systems which are in themselves vicious, and which can only be corrected by a radical change in the governmental machinery; and, second, those which result from the abuse and corrupt use of agencies which in themselves are proper and beneficent, but which, in the hands of designing men, come to be efficient aids of fraud and the most obnoxious forms of wrong-doing. This class of evils can only be corrected by devising some means which shall keep the government in the control of its best citizens. Can this be done, and, if yes, then how?

Let us first note some of the difficulties of the problem, and then ascertain, so far as we may be able, what are the possibilities and methods of its solution.

As a primary proposition it may be stated that the lack of a general and comprehensive act of incorporation has been the cause of endless embarrassment and difficulty in the management of city affairs. In many States the method of municipal incorporation has been by the granting of special charters. These charters possess no uniformity as to the powers conferred, but in each case represent such powers as the persons asking for them deemed it desirable to have, or such as the Legislature could be induced to confer.

Frequently it has happened that neither the incorporators who were seeking charters, nor the legislators who granted them, were persons who had had such experience in municipal affairs as to guarantee that the corporations which were to be created would be possessed of needful powers and restrained by proper limitations. Ordinarily, almost as a matter of course, there would be found but little difficulty in starting off the new municipality, for its most obvious needs would have been recognized and provided for, but as little or no thought had been taken as to the future demands which would be made upon it, and no adequate provision had been made for the needs of a largely increased

constituency, it would by-and-by be demonstrated that the powers and privileges which were amply sufficient for the small constituency were too limited when the growth of the city demanded increased facilities and improvements.

An attempt would then be made to meet these demands, not by abrogating the original act of incorporation and substituting for it such a system as should be comprehensive and sufficiently elastic to respond to all legitimate demands that should be made on the governing power, but by amendments and additions, and the substitution of boards of commissions, until the whole system became inextricably involved. As a result we find in many municipalities separate boards of control for the government of the fire and police departments, election boards, school boards, boards of health, boards of visitors, and so on, until the multiplication of authorities has subdivided responsibility into homœopathic quantities. The tendency is also to apply the homœopathic treatment, and, on the theory of *similia similibus curantur*, to meet the constantly increasing difficulties by the creation of more of these boards and commissions.

We have in this country had an extensive and disastrous experience in this constant effort to meet the increasing demands of local government by supplemental legislation, but so far as I can ascertain we have not yet even approximated the achievements of our English cousins in this patchwork style of city government.

The English municipal reform bill was passed in 1834. Since then there have been passed seventy additional acts, all of which are in force, and which are applicable to all boroughs. These are supplemented by nineteen further acts, which, to a greater or less extent, effect these municipal organizations.

In addition to these acts I find it stated in a number of the "Contemporary Review" that there was, at least until recently, comprised within the limits of one poor-law union, two municipal boroughs with town councils, eleven local board districts, three boards of guardians, twenty-four bodies of overseers, five burial boards, two school boards, and one highway board—in all forty-eight local authorities, each acting independently and having jurisdiction in the same territory; a condition of things that would seem in contrast to render Babel a veritable haven of rest.

Our own experiments with this system of government by local boards and special commissions, whether these independent bodies have been created to meet some pressing need for which the organic act of incorporation did not make provision, or whether organized in the hope of rescuing a part of the municipal machinery from the control of the Tweeds and McManes and their disciples and imitators have been alike disastrous: the first, because the *imperium in imperio* is necessarily self destructive; and the second, because the vultures which prey upon the body politic will as certainly find the means to

control these special organizations as they have hitherto found the means of dominating other governmental machinery, will man them with their own agents, and thus make them the subservient tools of a criminal regency.

Chicago struggled along under burdens of this sort for a good many years, but at last in sheer desperation it surrendered its original charter, together with all the ornaments with which subsequent legislation had decorated it, and organized under the general incorporation law of Illinois. So far as it has been tested, this law seems to have been wisely and intelligently framed, and, while it is adapted to the wants of small constituencies, it is sufficiently elastic to meet the demands of large cities. It at least possesses the important feature of making a single body responsible for the municipal government, and the executive becomes personally and directly responsible for the direction and administration of municipal affairs. Under it Chicago has thus far by no means attained to an ideal city government. Indeed, the events of the last year would indicate that it had but illustrated how thoroughly a good agent may become prostituted to evil purposes. Nevertheless, the imperfections of our municipal government (and their name is legion) exist in spite of the character of its organic system, rather than in consequence of it.

It is an important matter to definitely locate responsibility. When the responsibility can be subdivided among several independent bodies, or is shared by the chiefs of various departments, it rests with no special weight upon any individual. But when it can be located, when the people can come to the derelict councilman, or to the chief executive, and say, "Thou art the man," good men will always be more careful, and even bad men will become circumspect.

This principle is constantly attracting more and more attention. Boston has recently made some radical changes in her municipal system, which, while they do not go so far in the direction of localizing responsibility in the person of the chief executive as is now true of the city governments of New York and Brooklyn, still largely increase the power of the mayor, and make him to a greater extent than ever before responsible for the conduct of municipal affairs.

There can be but very little doubt that this will be found to be a change in the right direction, and all students of municipal reform will be interested to note whether, after testing this principle, the Boston constituency will not be inclined to give it even a more emphatic application.

But no system, however good in itself, is self-executing. It is not enough that the government shall be founded on right principles. Its administration must also be in the hands of trained and true men. This is a matter almost lost sight of in municipal affairs. Men are selected for city officers for almost every conceivable reason than that which should outweigh every other consideration, namely, their ability

to discharge the duties thus devolved upon them. They are selected because they are Republicans or Democrats or Mugwumps. Perhaps they are politicians, and must be paid for services rendered. It may be that they have influential friends who desire to provide for them in the public service, or for some equally insufficient reason they are placed in charge of interests for the care of which they are utterly incompetent.

A private enterprise conducted on this plan would soon come to a most disastrous result, and every intelligent man would declare that such a result was deserved and inevitable. But seldom is this rule applied in passing judgment on public affairs. There seems to be a kind of undefined belief that public interests can be cared for by almost any persons, or that they can for the most part care for themselves, or that they are in some inscrutable way under the care of that Providence which is said to protect the lives and persons of idiots and inebriates. When the plundering of the public revenue is discovered, when the ballot-boxes are stuffed or stolen, and when by official incompetency or rascality the public safety or the public health is jeopardized, men shake their heads ominously, give a passing moment to reflections on the depraved state of municipal affairs, indulge in a few evil predictions, and pass on to their banks, their factories, or their merchandise, leaving these affairs to drift on to a destruction concerning which the only question is as to whether the *dénoûment* is more or less remote. Then, when the disaster or evil is upon them, and the effort to provide a remedy can no longer be postponed, relief is sought from some additional legislation or to some new device of administration, rather than by a resort to the simple and common-sense plan of putting municipal affairs in the hands of skilled and honest administrators. As to the methods of securing such officers, I shall have something to say farther on. In the administrations of city governments we find misgovernment manifesting itself in so many forms that it would be impracticable to make note of all its phases. Nor would such an effort prove interesting, even if perhaps it might be instructive.

To those pronounced and flagrant forms of misgovernment which arrest the attention of even the casual observer, I shall not at this time allude, except as I may suggest some method of correction. It will be well, however, to refer to some less obtrusive instances which may not always be suggested to us in our examinations. And first, let us note the liability to mistake in connection with our public charities. The sentiment which pervades every rank and condition of society, demanding that relief be given to the suffering and that the wants of the needy be supplied, is creditable to humanity. It has, too, most abundant opportunities for exercise. No proposition has been more fully confirmed by the experience of mankind than that "the poor ye have always with you." In many of our municipalities the charge for

poor-relief is one of the heaviest items of expense. How to render this assistance so as to secure the greatest good, and to do the least harm to those who are aided, is a question very difficult of solution. Public institutions, such as almshouses, hospitals, and infirmaries of various kinds, must of necessity be provided. In no other form can we meet the demands which we have neither the right nor the disposition to ignore. These benevolences, however, are not always managed in the interests of either the inmates or of the municipality. Officers are appointed and dismissed according to their subserviency to the appointing power. Employés who are not utterly incompetent to discharge the duties devolving upon their positions, and others who are not expected to perform any duties, are carried on the pay-roll, and the semi-seclusion and retirement which seems to invest such institutions, to a certain extent protects the details of their operations from public scrutiny. Complaints seldom receive attention, or are regarded as the querulous vagaries of an impaired intellect, and it is only in some of those spasmodic convulsions which occasionally rock to the very center some city government that we obtain an inside view of these affairs. At such times the public sensibility is apt to be shocked at the revelations which are brought to light, and the people wonder that evils of such magnitude could have existed undiscovered in their very midst.

There is another form of public charity which in the West we call "outside relief"—i. e., temporary aid in necessitous cases, which in the aggregate constitutes a very large expense, and the effect of which is not easily ascertained. Charitable aid in substantially this form seems to be a necessity in every community. Just how far it ought to be a gratuity is a matter deserving careful consideration. I am quite sure that this form of poor-relief is frequently so administered as to encourage pauperism. It creates a class of dependents who become imbued with the idea that such support is an inalienable right; all stimulus to industry and thrift is lost, and "pauperism becomes a profession."

I have a friend who, at a time when there was great want and suffering among the poor of Chicago, established a free Kindergarten where, during the day, little children could be left by their mothers, who thus had freedom for any employment which they could secure. This was continued until a change in business affairs seemed to obviate any further necessity for such a charity. The school was then closed, and its patrons became indignant. There seemed to be no gratitude for favors received, but rather a sense of personal wrong in the withdrawal of what had come to be looked upon as a permanent arrangement for their benefit. The effect of this charity was in the direction I have indicated. It begat a spirit of dependence on the part of its beneficiaries, and relaxed their sense of obligation to provide for their own necessities. I believe it to be a typical illustration.

It is a difficult thing to bestow a charity in such a way as not to do harm to the beneficiary. In so far as it is practicable, there ought to be some kind of *quid pro quo;* aid granted should take the form of payment for some kind of service rendered, even if the service be of no value to the donor.

The city of Providence is moving in this direction. No donations are made to transient mendicants. Vagrants, tramps, and beggars are taken in charge by the police. Food and temporary lodging are provided by the city. A certain amount of labor is demanded of each able-bodied recipient of relief in payment of his entertainment, and the result is that that city is shunned by the professional pauper as if it were a pest-house.

Illustrative of another manner in which charities become perverted from their originally beneficent purpose, I would refer briefly to a report as to the London guilds, made by the City Companies Commission, published not long since in the "Pall Mall Gazette." These guilds or societies were originally benefit societies or charitable associations, and were under the care and protection of the city. In process of time they become the trustees of various bequests made for securing an annual income to some charitable institution or purpose. The guilds were simply trustees of this property, never its owners. As years passed by, the operation of natural causes enormously increased the value of the properties under their care, so that they are now estimated to be worth from $75,000,000 to $100,000,000, and the annual profits about $4,000,000. But the guilds as trustees only pay over to the charity funds the income on the original value of the bequests. As, for instance, where the rental of a certain realty was at the time the bequest was taken in charge by the guild $100, it is now $10,000; the guild, however, pays over to the charity the $100 and pockets the $9,900. Not a member of these guilds is entitled to a penny of this money; yet, by a system of "payment of privileges," which is a polite way of saying "the purchase of a right to steal," these guilds, besides spending hundreds of thousands of dollars of these trust-funds in banquetings and entertaining their friends in a sumptuous manner, pocket annually a handsome income for themselves.

The members of the guilds are, by virtue of said membership, invested with the municipal franchise, and are permitted to vote either in person or by proxy, and thus are admitted to the very select number who control the affairs of this immense metropolis. Mr. Gladstone not long ago characterized these guilds as associations for the cultivation of gastronomy, which occasionally gave a five-pound note to charity.

In a number of instances like provision was made for the support of churches and schools in particular localities. The changes caused by the demands of trade long ago deprived both churches and schools of their constituency. But the farce of maintaining religious worship

in one place and a form of instruction in the other is maintained in order that the incomes appropriated to their support may not be sacrificed. The clergyman lives ten, fifteen, or twenty miles distant. He has no parish, and in some instances no congregation, but he comes to the church and goes through a form of religious service once or twice on Sunday. In one instance it was discovered that one man constituted the entire audience, and that he was paid a certain sum each week for playing congregation while the clergyman conducted the service!

In the city of London there are several parishes whose limits do not extend beyond the walls of the church-building—but which are in receipt of very generous incomes. In an article on the Bank of England, by Henry May, in the "Fortnightly Review," we are told that "this edifice" (the Bank) "was greatly enlarged between the years 1770 and 1786, and was completed pretty much as it now stands in 1786; an act having been procured in 1780 to enable the directors to buy the adjoining church, land, and parsonage—in fact, the whole parish of Christopher Le Stock—to the rector of which non-existent parish the bank pays four hundred pounds sterling per year to this day."

I am not aware of anything in America which parallels this condition of affairs. Our country is not as yet old enough for this; our conservatism is not of the right type, nor our veneration for such a class of "vested rights" sufficiently pronounced to afford favorable conditions for the existence of such abuses. I do not think it probable that they could maintain an assured footing among us. But we may be well warned against a system which tends in this direction, which is in itself vicious, and which must ultimately involve us in greater embarrassments.

The efficiency and success of a municipal government depend in a great measure upon its police establishment. The protection of life and property, the security of peace and good order, the suppression of crime and the arrest of criminals, are the special care of this department. Failure in these particulars is a fatal defect. Success in this branch of the government would palliate and atone for many shortcomings elsewhere. So far as I am able to learn, our American cities have no well-organized and well-sustained police force. Almost everywhere the police organization is used as a partisan political machine. If we recall the events of the past eighteen months, the statement will be confirmed, and we will find that the Republicans of Cincinnati and the Democrats of Chicago seem to vie with each other for an unenviable supremacy in this direction, and that each seems likely enough in its turn to surpass the other. The difficulty is fundamental, and relates to the theory of organization. Appointments to the police force, and promotions in the service, are made at the dictation of professional politicians, and as a reward for partisan services. A

failure to perform these services is equivalent to an application for discharge. Efficiency in the line of duty will not atone for a lack of zeal in elections, and skill in detecting crime is of less moment or value than skill in managing primaries or conventions. Thus, the *morale* of the force is constantly being depreciated. It is impossible to appeal to its professional pride, its enthusiasm, or its professional *esprit de corps*. And the members of the organization, instead of constituting a dignified and respectable department of the municipal government, degenerate into time-serving placemen.

As a matter of experience, we have learned to expect, at the end of a newspaper paragraph announcing the perpetration of a crime, the assurance that no arrests have been made; and the comparative immunity of the criminal classes among us is a continual disgrace to our civilization.

The police system of some European cities is far more efficient than anything of the same sort in this country. Especially is this true of Paris. It may be objected that in the latter city the system is too efficient, and partakes *too largely* of a method of espionage and surveillance. I think that this objection would be valid. The Parisian police force would not be, and ought not to be, tolerated in any American city; but the reasons for this apply to some of the inquisitorial and detective purposes for which the force is used, and do not apply to the plan on which it is organized.

I would make the police service a profession in the same sense that the army is now a profession. Let its rank and file be composed of enlisted men who would be subject to discipline and dishonorable dismission for proper cause, in accordance with appropriate regulations adopted for the government of the force, but who could not be otherwise discharged. Let the officers be gentlemen trained to their profession, men holding a commission as honorable and desirable as that held by a military officer and subject to similar conditions. Let promotions be made for faithful and efficient service, and in recognition of exceptional ability.

Let the service be organized on the theory that it is a worthy profession for men of high character and ability. Let it be lifted out of the domain of politics and take its proper position as a department of the city government—a department which can in no way be affected by the mutations which attend the annual elections—and we would have as a result a police force which, either as to its *personnel* or the character of the work which it would perform, would be unexcelled.

The best method of raising the revenue necessary for carrying on the municipal government is an intricate problem, and one which, at one time or another, has received a great deal of attention. The systems in operation in different localities are widely different, and the proper discussion of any of them would not be practicable at this time.

There are, however, two features of this subject which I am not willing to pass in silence:

1. As to that class of *quasi* public corporations, such as street and elevated railways, ferries, gas companies, and the like, which derive all their privileges from the municipal government and are subject to its control. From modest beginnings these organizations frequently grow to vast proportions, and their plant and franchise become a most valuable property.

When first introduced the popular demand for this class of improvements ordinarily enables these companies to secure specially favorable terms from the municipality. As time passes they become thoroughly established and wealthy, even if they do not become arrogant and defiant. Their contributions to the revenues of the city, however, continue to be based on the favorable conditions under which they were first brought into existence, and in no sense amount to a fair return for the privileges and immunities granted to them. In all such cases the city might be protected by reserving to itself a fair proportion of the receipts of these companies, which should be in lieu of all other forms of taxation.

Under such an arrangement the tax on the corporations would be determined by their own prosperity, being light when their earnings were small, and larger with their increased ability to pay, and the city would receive a just return for the benefits it conferred.

2. I would call attention to the exemption of certain property from the payment of its share of the public burdens. I refer to the elaborate and costly church edifices which are so prominent a feature of every large city. Though I do not believe that the position is logically sound, nevertheless it is in accordance with the traditions of this people, and in harmony with the principles on which our State and national governments are founded, that buildings used for public worship should be exempted from taxation, and to this practice, as applied to modest structures of reasonable value, I do not offer any opposition. But it seems to me to be clear that the magnificent structures which abound in all our large cities can not claim a place in this category.

It is scarcely a proper use of language to denominate them houses of *public* worship. Though they are nominally open to the public, still their appointments, their furnishings, the style of their services, their practically reserved seats, the restrictions as to the time of admission of any except pew-holders, and the accommodations provided for the public, all warrant the statement that they are really the private religious club-houses of wealthy parishioners, whose right to erect and maintain and enjoy them is unquestionable, but whose right to do all this at the public expense is by no means so apparent.

These institutions share in all the benefits of the city government, are guarded by its police, are protected by its fire department, are approached by streets lighted, cleaned, and paved at its expense, and, in

the event of their unlawful destruction, the municipality would be liable to respond in damages for their full value—all this for the accommodation of a small fraction of the people. It seems to me that the value of these structures, at least so much of it as exceeds a certain reasonable limit, should be taxable. No principle is more firmly imbedded in our political system than that the support of religious worship and institutions shall be entirely voluntary. The exemption of this class of property from taxation violates the principle, in that it is a forced contribution on the entire community to the extent of the exemption; and it is the less defensible, in that the exemption is in favor of that portion of the community that could with the least difficulty meet its obligations.

If the matter were presented in the form of a proposition for a direct tax for the maintenance of the churches, it could not find support in any quarter. No community in our land would consent that either the State or the municipality should levy any direct tax to be appropriated for the support of religious services or institutions. Why it is the less objectionable, because it takes the form of special exemption from a common liability, I am utterly unable to understand.

Another instance of the abuse of municipal authority (and the last to which I shall refer at this time) may be found in the legislation affecting railway corporations. The constantly increasing volume of railway traffic demands almost daily increasing facilities for its accommodation. New railways are constantly seeking entrance into or a right of way through all our large cities. The granting of new franchises as well as the regulation of the train-service on all lines; the protection of those streets which are either crossed or traversed by railway-tracks; the construction of viaducts and bridges, are matters in which the municipality and the railway corporations are mutually interested, and which ought all to be considered and decided simply in accordance with their relation to the public interests. As a matter of fact, the public interests have very little to do with such decisions. The railway companies have learned that any legislation which they may want, however necessary and proper it may be, and however much it may promote the general welfare, must be well paid for; that any privileges, however legitimate, which affect either their own interests or the interests of their patrons, can only be had by the payment of a price to the city government.

Within a few years a certain railway corporation applied for a right of way into Chicago, on a route by which a great deal of the most valuable property of the city was seriously damaged. At first no one seemed to think that the project could be *bona fide*. When it became apparent that the corporation was in earnest, it was still felt that it would be utterly impracticable for the company to secure from the City Council such an ordinance as would enable it to carry out its plans. But the matter was in the hands of able attorneys and shrewd

business managers. Step by step it progressed, and finally became a consummated fact. It was freely charged and is universally believed that the ordinance cost the railway company half a million dollars! So far as I can learn, the charge has never been denied.

Within the last few months another railway project was inaugurated. Application was made to the Chicago City Council in its behalf for an ordinance granting the right of way into the city, and for the right to lay its tracks in certain streets. The application was powerfully supported by one of the great railway organizations of the West, and was as vigorously opposed by a rival company of equal wealth and influence. As the contest proceeded it attracted very general attention and interest. In the discussions had in reference to the matter it came to be openly asserted, both in private conversation and in the public press, that those members of the Council who favored the proposed ordinance were in the pay of one corporation, while those who opposed it were classed as the paid agents of the rival company!

In the discussions to which the matter gave rise, the idea that any member of the Council advocated or opposed the ordinance on its merits did not seem to present itself to any one. I do not mean to affirm that the facts were in harmony with this theory. Indeed, it is very certain that the City Council of Chicago is in part composed of gentlemen of the highest integrity and character. But I noticed these expressed opinions as indicating the standard of public sentiment. People have become so accustomed to venality on the part of municipal legislators, that the first impulse is to interpret their official actions as the *quid pro quo* of money considerations, and experience proves that as a rule the theory is correct.

In support of my conclusions let me quote a single paragraph from a pamphlet entitled "Problems of Municipal Government for Chicago," by Hon. D. L. Shorey, who has for many years been a member of the City Council of that city, and who deservedly ranks among Chicago's best and ablest citizens. He says: "There is a wide-spread impression that a majority of the Council is venal. Assuming that this is true, it certainly shows a very bad state of affairs, and that there is imperative need for reform in that body. The evil is even more dangerous than is generally supposed. The disease really exists elsewhere, and is only manifested in the Council. There is an outside purchaser for every venal vote. In this case the purchaser is the more dangerous man of the two. He is probably an officer in some moneyed corporation; is sometimes a member of some fashionable church, stands high in financial and social circles, and is an influential factor in controlling public opinion. On the other hand, the Council is largely composed of young and untried men of moderate social distinctions. Such men have neither the social nor intellectual fiber to resist a moneyed temptation, and it is no marvel if three out of four of them are not able to resist such temptation."

Mr. Shorey here admits judgment by confession, and his opportunities for knowing whereof he affirms are especially favorable. Without waiting to determine whether, as Mr. Shorey says, the man who makes merchandise of a public trust is less culpable than the other man who purchases what the trustee offers for sale, we will at least agree that we have fallen upon evil times, if the public interests are to be subordinated to the office-holder's cupidity.

It is not strange if private corporations, finding that they can only obtain legitimate privileges and authority by the payment of a certain largess or bounty, attempt to secure, perhaps, by the payment of an additional fee, perquisites and privileges which a proper regard for the public interests would deny them.

The magnitude of this danger can not be exaggerated. Private rights and interests are jeopardized, and, if maintained at all, are only so maintained at the price of an expensive litigation, which is a substantial denial of justice. Competition is prevented or crushed out by the potent agency of gold, and the public, bound hand and foot by its own trusted agents, is surrendered to the greed and avarice of private corporations.

The practice of purchasing municipal legislation is not peculiar to American cities. Thomas Hare, in "Macmillan's Magazine," says, as to London: "The ascertained cost of legislation, to the companies who are forced to seek it, is enormous. Railway bills have cost from £650 to £1,000 per mile. Power to make twenty-nine miles of railroad cost the Hereford Company £250,000, equal to $1,250,000; and, before a spade was put in the ground, the Great Northern Railway had paid £420,000, or $2,100,000, in parliamentary costs!"

Is it not reasonable to expect that companies paying such enormous charges will attempt to obtain privileges and concessions somewhat commensurate with the outlay involved; and that they will endeavor to recoup from the public the money which they have paid in securing their charter privileges?

No opposition will be offered to this proposition:

"It should be practicable for any corporation to obtain a legitimate and proper franchise without the payment of fees for legislative favors. It ought always to be understood that illegitimate privileges or concessions prejudicial to the interests of the community could not be obtained at any price."

The recent developments in the matter of the Broadway Surface Railroad disclose a condition of affairs not only disgraceful to the venal participants in the infamy, but perilous to the community. It does not seem too much to demand that the municipal government be placed on a basis which will protect the public against such a prostitution of municipal powers.

The security of the public in all these cases is in the *personnel* of the city government. If it is practicable to put into that government

men of character and integrity, and only such men, the problem is solved. If this be not practicable, it would seem as if the only alternative is to go on from bad to worse, until the whole municipal system breaks down under the weight of evils which are inseparably connected with its present organic form, and makes way for some new system of governmental control.

And this brings us to the consideration of the ways and means of correcting and preventing the evils which have been referred to, as well as the long, long list of other evils which from time to time force themselves upon the attention of the public.

[*To be continued.*]

A SCIENTIFIC MISSION TO CAMBODIA.

By M. MAUREL.

THE countries now known as Cochin-China, Annam, Cambodia, Laos, and Siam, and probably the whole Indo-Chinese Peninsula, were occupied primitively by a dark-colored race, remnants of which are still to be found in the mountains, on whom their conquerors, all having the same feeling toward them, have imposed names which in their several languages mean savages. At a period in the past which probably answered to the beginning of the Christian era, two conquering peoples took possession of the richer parts of the country and drove these tribes back into the mountains. They established the kingdom of Thiampa in the south, and that of Cambodia in the central region. Cambodia, now small in extent and weak, was formerly a powerful empire, and held under its allegiance, either directly or as tributary states, more than half of the Indo-Chinese Peninsula. Its splendor is attested by its numerous monuments of grand dimensions and beautiful architecture. Yet this Khmer people, which has left such admirable traces of its power and civilization, is an enigma to the world. We know very little of its origin, and hardly more of the period of its power. Its history, as we have it, prevents various phases of struggle and alliance with its neighbors, China, Siam, Thiampa, and Tonquin. It is supposed to have attained its highest state of splendor in the arts in the eleventh century. At the beginning of the eighteenth century it divided Thiampa with Annam and Tonquin. From that time on it suffered a succession of losses of territory till, in 1863, Norodom, its king, placed it under the protectorate of France.

Cambodia is situated between 10° 30′ and 14° north latitude and 100° 30′ and 104° 30′ east longitude, and has an area of about 100,000 square kilometres, and a population of 1,200,000 souls, of whom 700,000 are Khmers. It is traversed by the great river Me-Kong, which rises on the eastern skirts of the Thibetan table-land, crosses

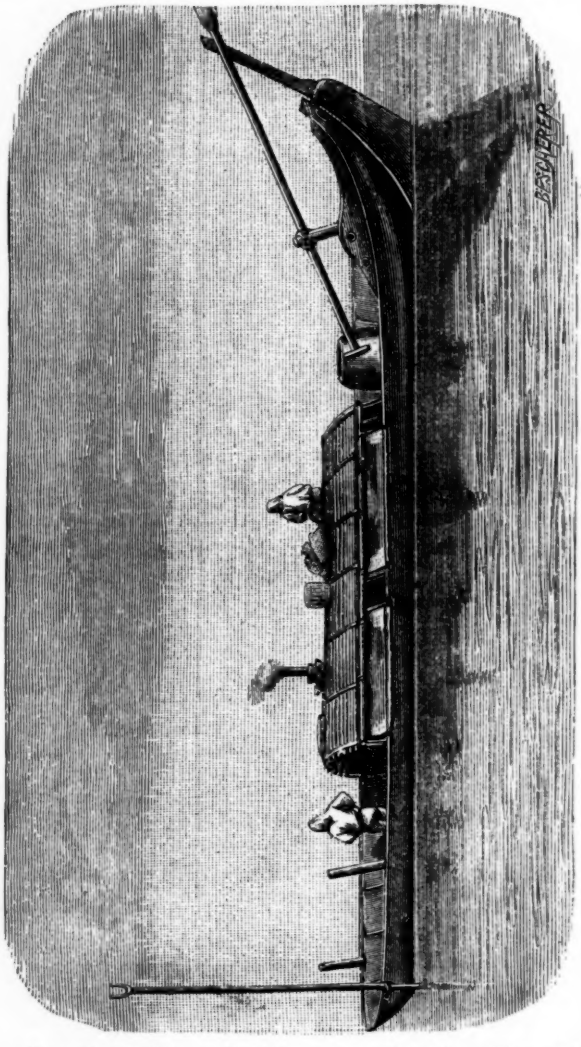
Yunnan and Laos in a narrow valley, and, entering Cambodia, pours its waters over it for about four months of every year. In the heart of this country the river is divided into three arms, two of which continue their course as the front and the back river, while the third turns back toward the Toulé-Sap lake. This arm presents the phenomenon, which is believed to be unique, of flowing during part of the year in one direction, and the rest of the time in another. When the snows melt, it is swelled to above the level of the lake, and turns its flood into it, and away from the sea. The lake thus serves as a waste-weir and regulator, and is capable of holding in reserve some thirty-five milliards of cubic metres of water. But this is not enough, and in some seasons the water, overflowing the banks of the river and its affluents, covers at least a third of the country and transforms it into a sea navigable for boats having a very respectable draught of water. This periodical inundation has impressed the manners and customs of the Cambodians with a peculiar stamp. The lake itself forms a prominent feature in the life of the people. It is about seventeen miles wide and ninety miles long, and furnishes in its fisheries one of the most reliable sources of the country's wealth.

The character of the Cambodian house is largely determined by the phenomenon of the inundation. It is built on piles, often, on one side at least, some twenty or twenty-five feet above the ground. The piles on one side stand in the river, and the door is on the other side. All that the proprietor asks is that the floor shall be a few inches above the water in time of freshet. He might put it on the level ground near the stream, but he prefers to have it overhang, in part at least, and slope. The floor is reached by ladders, which are drawn up in the evening—the surest mode of closing the house in a country where there are no locks.

Under the floor the pirogue is moored on one side, while the poultry, dogs, and pigs live on the other side. The pigs have hollow backs and their bellies drag on the ground, but their owner does not disdain to share his abode with them. I have seen the Cambodian and his pig lying side by side at noonday, enjoying their *siesta*. Places are also found under the house for the wagons, plows, and fishing-tackle. The floor is usually a wicker-work of woven bamboo laths, which bend and creak at every step, and which we, with our shoes and heavy walk, find it hard to get over. But the Cambodian walks light-footed and carefully, much as we try to do when we go on tip-toe, but, not being troubled by shoes, with vastly better success. Bending his legs a little and leaning forward, with his arms brought up toward his chest, he puts his foot delicately on two or three of the slats at a time, and walks noiselessly on, while we would always feel as if we were going to break through. These open floors are easily cleaned with a dash of water which runs off, no one cares where. In case the inundation should threaten to rise above them,

the owner can make another floor higher up, with some bamboo sticks and a few hours of time.

The house is only one story high. The framing of the roof except for the larger pieces, which are of timber, is made with bamboos of sizes graduated to correspond with the weight they are intended to support. It is covered with a shingling of palm-leaves, or with wisps



CAMBODIAN PIROGUE.

of straw, after the fashion of a European thatch. The outside walls and the partitions are often made in the same way. Inside, the house is divided into three or more apartments. The first, the vestibule, usually open in front, is reached by the ladder. Next to it is the principal room, serving for *salon*, dining-room, and bedroom, and from

this doors open into the private family rooms or apartments of the women and children, to which Europeans are not admitted, and native visitors but rarely. Two small rooms are also occasionally built by the sides of the vestibule for the young men. The girls, whatever their age, always live with their mother. The whole structure is some thirty-five or forty feet square. Besides his dwelling-house the Cambodian builds a taller house, also on piles and having no entrance except by a small window, which he is particular to make tight against the rain ; and this is the granary for his rice.

This description answers for the more common houses of the country—for those which are occupied by people in moderate circumstances. There are also other kinds of houses. The poor sometimes have to be contented with a low hut covering only a few square yards. The wealthy citizen may use timbers and planks instead of bamboo, but even the highest functionaries do not possess jointed planks. Luxury demands fine wood, but it is not carefully worked ; and in the houses of the ministers of state one can walk on planks two or three inches thick, showing very evident gaps, and not even nailed to the joists on which they rest.

These primitive huts are far removed from the ideas we have of Oriental luxury, and still further from those which we might conceive from the ruins that exist in the country. At present Cambodian construction does not go beyond wood. Only the pagodas are of stone, and there is nothing in any of those which are standing to remind us of the splendors of the past.

There is one town, the city of Compong-Chnang, of variable population, which may rise to five thousand during the fishing season, that is built entirely on floating rafts. The people carefully follow the movements of the water, drawing their houses toward the land when it rises, and pushing them out into the stream when it falls, but always so that they shall be close to the shore without getting aground. Nothing can be more picturesque than the appearance of this town at evening when lighted by Chinese lanterns. The houses are separate from one another, and never but one story high ; and the streets are regularly laid out.

The Cambodian's furniture is of the most primitive character. A table, a few stools, some earthen or copper spit-boxes, a few jars, and a bedstead made of boards, compose the useful part, while the ornamental is furnished by the arms and musical instruments hung on the walls, and mats laid upon the ground. When we go into these large rooms, we find them so scantily furnished, in comparison with our overloaded apartments, that we can hardly realize that they are occupied. But, then, what use has the Cambodian for bureaus, chairs, and tables? He has no wardrobe but his sampots, and he sits and eats on the ground. Our furniture would be a superfluity to him. What luxury he indulges in is in the line of wives, slaves, pirogues, and ele-

phants. The table is made of wood, the stools are of bamboo, and the jars are of copper, or cocoanut, or calabash. The inventive spirit of the people has been particularly exercised on the bed. While he is satisfied with a few rough-dressed planks for a bedstead, the Cambodian has received from his fathers and still displays great skill in

CAMBODIAN ARMS. 1, hand-spear; 2. sword; 3, 4, 5, 6, 9, white arms of different forms; 7, javelin; 8, trident; 1 , poignard.

making his mat and his mattress. The mat is an ordinary mat with tightly twisted tufts of cotton on the under side. The art of making these tufts is a special one, peculiar to the Khmer people. The mat is a valuable article in a country where journeys are often taken, for

it furnishes a sufficient bed, and is easily packed with the baggage. The necessity of making frequent removals has also inspired the Cambodian mattress. The mat is not thick, and furnishes a comfortable relief; but the Cambodian sybarites have sought for something better, and found it. They have invented a mattress as soft as our own and much more convenient for journeys; it can be folded up into so compact a space as to take up very little room, and it is made in such a way that, however thick it may be, it can always be done up so exactly that every part shall be sure to fit into the smallest possible space. These luxurious bed-clothes are, of course, only found among the better-off Cambodians. The poorer ones have to content themselves with a common mat, or a board, or the ground itself.

KING OF CAMBODIA.

The spittoon is in universal use. It varies in size and material, but not in shape. It is swelled out at the base, narrowly contracted above, and flares out into a funnel at the top—the whole giving it a shape well adapted to its use. The Cambodian is a constant betel-chewer; he has to be spitting all the time, and is under the necessity of having a dish always at hand to receive the blood-red saliva that escapes from his lips. The poor use an earthen spittoon. The rich man uses porcelain, and King Norodom has a spittoon of massive gold, carved and dressed with great taste.

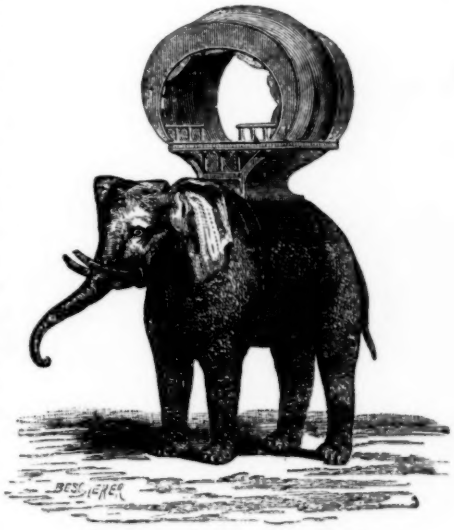
The housekeeping leaves much to be desired. One of the prominent characteristics of the people is to build and not keep up. This applies to their monuments, their houses, their boats, and their objects of art. But they do some cleaning, and use in it brooms made of the median nerves of palm-leaves and of cocoanut-fibers. They do very little in the evening. Their labors are performed during the day, which in that latitude is of nearly even length the year round. But if a man wishes to light his house or travel by night, he can use various torches, the most common of which is made of dried palm-leaves, tied together and steeped in resin. They are good enough to go around by, and are identical with the torches used by the natives of the Malabar coast. When they want a more steady light in the house they make little candles by dipping a cotton wick in melted wax and working it in the hand. This is really an article of luxury and is usually employed only before the altars in ancestral worship.

The Cambodian lives on rice and fish, and drinks water. Every other article of food or drink is to him only an accessory. Cambodian rice is one of the poorest kinds, being small and generally mixed with hard grains. It is thrashed out roughly, and is decorticated only as it is used. Fish is eaten fresh or salted, and, as the fishing-season is constant, there is always plenty of it, with a considerable surplus for exportation. The "extras" are chickens, eggs, pork, vegetables, and fruits, the chief of which is the banana. Tea is rarely taken at meals, but is served during the day, and offered to visitors. But little use is made of fermented liquors, and drunkenness is very rare. The liquor met most frequently is an alcohol of rice perfumed with essence of roses, which is known as *chum-chum*.

Their cookery is so strongly spiced that it is repulsive to Europeans. The Cambodian addresses himself by turns to pepper, ginger, mace, and various spices; but it costs the foreigner a long exercise to endure them. These, however, are condiments to which we are accustomed, and the only difference between our habits and theirs is in the quantity. But it is a different affair when we come to a product which the Cambodian likes well enough to set everywhere—the *nuoc-man*, or oil of fermented fish. The Annamites use this, too, but they refine it. The Cambodian prefers for his sauce to have it of the most pronounced flavor, without its having undergone any filtration or other process to attenuate its taste or odor. Offensive as it is at the first interview, I have known Europeans to learn to like it and to eat it with relish.

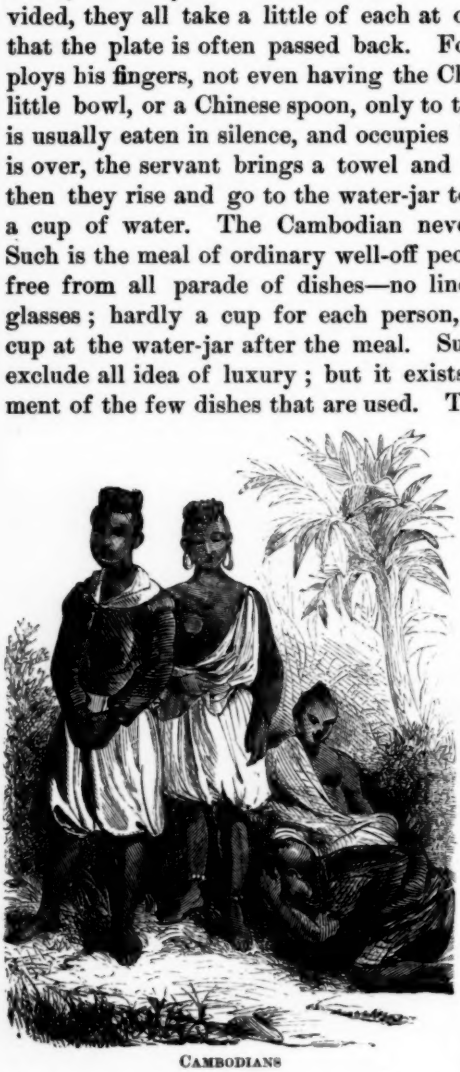
Instead of fireplace and chimney, the Cambodians use ingeniously constructed portable furnaces of terra-cotta. I find in this another illustration of the fact I have already referred to, that the inundation, by compelling the Cambodian to be a water-man for a part of the year, has given a special direction to his industry, the characteristic feature of which is the invention of portable utensils equally adapted to service

on land and on his narrow pirogue, and also occupying but little space. The furnace of Campong-Chnang is in the shape of a calabash, divided by a horizontal plane into two parts. The smaller end, provided with three legs, is the kettle; and the other end holds the coal, wood, and ashes. With this apparatus the native can do his cooking anywhere, on the ground or on the lightest boat, without danger of fire. Nothing could be better for its purpose. The people also have a taller kind of furnace, but it is less convenient and more fragile, and is not in general use. The vessels for cooking have nearly always the same shape, and differ only in size. Vessels of the same kind are also used for pitchers, and when designed for this purpose are furnished with a withe, which, after being wrapped around the narrow part several times, is formed into a handle. They are used in pairs, and carried by means of a bar over the shoulders. The meals are eaten sitting on the ground. Tables are used only to put things on temporarily. The countrymen have two meals—the first at ten o'clock in the morning and the other at five o'clock in the afternoon. In the towns they sometimes have three—the first at nine o'clock, the second at one, and the last at six o'clock in the evening. The one-o'clock meal is light, and consists chiefly of a pottage of rice. The others are more substantial, and include, besides rice, which takes the place of bread, fresh fish in the morning and salt fish in the evening; and when they have chicken and meat, it is at these meals. At meal-time the members of the family collect around a mat which is set in a particular part of the house, the usual place for that house, but different in different houses. They sit on the ground, with their legs thrown over to one side. Some of them, perhaps, will squat, in what is an habitual position of resting with this people. The wife in a poor family, or a slave in wealthier ones, then brings in a dish furnished with bowls containing the meats, one of which is given to each *commensal*. In the event of a more elaborate repast, where a variety is provided, the different dishes are brought on in succession. But this is rare; for the Cambodian, like the people of warm climates generally, is extremely sober, and it is not without considerable astonish-



CAMBODIAN ELEPHANT AND TENT.

ment that he sees us swallow, at a single meal, a quantity that would suffice him for two or three days. The whole dish is screened with a hood of straw, covered with cloth, which protects the meats against dust and keeps them warm. The head of the house removes the cover, and they all fall to with a will. When several dishes are provided, they all take a little of each at once, and it is only a little, so that the plate is often passed back. For service, the Cambodian employs his fingers, not even having the Chinese chopsticks, and using a little bowl, or a Chinese spoon, only to take up the sauce. The repast is usually eaten in silence, and occupies but a few minutes. When it is over, the servant brings a towel and the family wipe their hands; then they rise and go to the water-jar to wash their hands and drink a cup of water. The Cambodian never drinks while he is eating. Such is the meal of ordinary well-off people, as simple as possible, and free from all parade of dishes—no linen, no covers, no knives, no glasses; hardly a cup for each person, and only a family drinking-cup at the water-jar after the meal. Such simplicity should seem to exclude all idea of luxury; but it exists. It is shown in the enrichment of the few dishes that are used. The plates of the poor man are plain; those of the rich are decorated; and they may be of earthenware, of porcelain, of copper, plain or chased, of silver or gold.



CAMBODIANS

Tea is reserved for refreshment between meals, and to be offered in compliment to visitors. Whoever goes into a Cambodian's house is offered tea, and it is a sign of esteem and friendship to take it. A refusal would be misconstrued.

The costume of the Cambodians is peculiar to them. The *sampot* is their only native garment, for all others that they may wear may be regarded as Siamese or Annamite importations. The manner of wearing it is distinctive to the Khmer race, for the other people of the country wear it differently. The sampot is a strip of cloth about a yard wide by three yards long, generally woven whole, and after patterns that have come down from remote antiquity. With the common people it is cotton, with well-to-do people it is silk, while the rich some-

times have it trimmed with silver or gold. It is put on by wrapping around the loins and bringing the ends forward; then, taking it by its upper edge, at about half a yard from the body, the two handfuls of cloth are twisted round each other, and it is tied with the same kind of a knot as the Chinese and Annamites use to fasten their trousers, while the parts of the ends beyond the knot hang down in front; then they are twisted up, passed between the legs, carried back and fastened behind to the strip over the loins. The legs are thus enveloped in a kind of wide breeches. This constitutes the whole of the Cambodian's country costume. He is otherwise barefooted, bareheaded, and barebacked. Richer men, however, wear under the sampot short drawers of light, white goods; and townspeople wear over it a belt with a metallic plate, which they have adopted from the Siamese. Another imported garment is the Siamese paletot, a coat fitting the shape, opening and buttoning in front, and coming down to the hips. The sleeves are straight and of the full length of the arms. The nobles and mandarins have very recently adopted the European short-coat; and the dandies have borrowed a scarf which properly belongs to the women. They usually wear it tied around the waist, while a few throw it over the upper part of the body; but this is a violation of the rites, and those who commit it are cautious enough to let their scarf drop when they see any high functionary of their race coming. The hair is worn short behind and three or four inches long in front. It is parted in the middle or at one side, and set off with a flower behind the ears. Women also wear the sampot arranged in the same fashion as that of the men, but without the drawers, and of a different color from the masculine garment, it being the woman's peculiar privilege to wear green and rose color. Their scarf is usually of silk, and of some striking color, different from that of the sampot, and is gracefully thrown over the body so as not so much to hide the breasts as to give them support; and the Cambodian woman is not at all concerned if her breasts are fully exposed. Some women wear a kind of robe or chemise with tight sleeves extending over the sampot to just above the knees. They wear their hair short; and this, with the likeness of their dress to that of the men, and the men's smooth faces, makes it a matter of no little tact to tell a man from a woman.

Children of both sexes go nearly naked till they are about seven years old. Their hair is the object of one of the most cherished customs of the Khmer people. At two years of age it is cut off, all except a tuft on the top of the head, which is left to flow, or is tied up or fastened with a pin till the youth reaches the age of puberty. It is then cut off with a solemn ceremony, marked by rites which have come down from antiquity, to witness which all of the family and the *bonzes* are invited. In the royal family the occasion is honored by grand festivals, in which all the people participate.

The Cambodian is an indefatigable walker, a good horseman, and

a boatman of rare skill. His favorite sports are boat-races, tennis, and shuttle-cock, to the last of which adults devote themselves with great zest. The shuttle-cock, which is thrown by the toe, often passes from one pair to another fifteen or twenty times without touching the ground. These games of skill are, however, second in favor to the games of chance, of which *bacoing* and the game of the twenty-six

STIENG SAVAGE, COCHIN-CHINA.

animals are the chief. The former game is common to all the extreme East, and even numbers many Europeans among its votaries. The game of animals is more peculiarly Cambodian. It is a lottery, in which the numbers are represented by animals; and these give it life and touch the fancy of the players in a thousand ways. Roulette-players are sometimes struck by a particular number, and put a great deal of trust in it. How much more should an animal enlist their confidence! Its appearance, its voice, the direction of its course, are precious signs to the Cambodian player; and as he is, moreover, superstitious and frequently idle, it is easy to see how prominent a place these fascinating diversions occupy in his mind.

Like all people who have struggled for existence through centuries, the Cambodians rigorously preserve their usages. It appears that as the power of a nation declines, and its means of defending itself against foreigners become less effective, the people feel the need of establishing a rallying-point for their nationality, and find it in their institutions; and these they learn to cherish all the more as a memorial of the time of their national glory. Numerous old customs are preserved in this way in Cambodia. Perhaps the most interesting of them are those which relate to betrothals and marriage. Betrothals sometimes

STATUE OF THE LEPROUS KING, FOUNDER OF ANGKOR WAT.

take place at a very early age; but in case the parents have not entered into any engagement, and the young man has made his own choice, he addresses a woman whose business it is to attend to such matters, and employs her to sound the heart of his chosen girl and the disposition of her family. If his overtures are accepted, he visits the house of the young woman, making his salutations at the foot of the stairs and at the top, and explains the object of his visit to her parents.

They receive him, and generally accept him as a betrothed suitor, when he takes up his abode in the house and becomes a kind of domestic, almost a slave, to the family, assisting them in all their labors. In this way they have an opportunity of judging what he is good for. The length of this time of trial is controlled by the degree of hesitation manifested by the young woman; but the waiting has its compensations. She makes it her business to prepare the quids of betel and the cigarettes for her swain. This done, she puts them in a convenient place where he will find them, or she may venture to offer them to him herself. The residence under a common roof is accompanied by corresponding privileges. If the authorized relations are passed, and children are born, they are regarded by the law as legitimate. Betrothed are protected by the same legal sanctions as married women, and the groom has the same right over her as he would have over a wife. The difference between betrothal and marriage is that betrothal is more easily withdrawn from. If the rupture comes from the groom, he has only to go away; if from the young woman, her parents must pay him an indemnity proportional to the services which he has given during his residence in the house.

To admire the arts of Cambodia we must go back into its past. We can gain some conception of what they were by looking at those immense monuments that confound our Western pride by their dimensions, the beauty of their proportions, and the finish of their details. Angkor Wat, although deserted by the crowds that once gave it life, plundered by the vandalism of conquerors, aud disintegrated by time, still bears comparison with the finest of our monuments. The religious sentiment has never conceived anything more elevated or grander. We are forced to believe that when architecture had reached such a height, the other arts must follow it if only at a distance. The two thousand square yards of bas-reliefs which decorate the halls of the pagoda of Angkor, and the hundreds of statues it contains, testify for sculpture. The condition of music and poetry is attested by the airs and songs which we still hear—the same that resounded under the ceilings of the holy places centuries ago. There is no room to doubt that luxury and the arts once flourished in the Khmer country.—*Translated for the Popular Science Monthly from the Revue Scientifique.*

THE WHITE-FOOTED MOUSE.

By CHARLES C. ABBOTT, M. D.

OFTEN, as early in autumn as the first of October, the abandoned nests of cat-birds and cardinal grosbeaks, and to some extent those of the brown and song thrushes, will be found very frequently to be tenanted by those beautiful little mammals, the white-footed mice (*Hesperomys leucopus*).

While the fact of such situations being chosen by these mice, for their winter quarters, has been long known, I am not aware that observation has been carried beyond this point; and I recently endeavored to determine, first, to what extent these old birds' nests are remodeled; and again, whether or not some of them may not be constructed *de novo*, the builders using the abandoned home of a bird for the exterior of the new structure, and removing it, bit by bit, from its original site.

In the months of October and November of the past year (1885) I examined a series of forty-two nests, all of which were above the ground, and occupied by mice. All were strikingly different from any nest of a bird, such as is found in so exposed a position; none being open above, nor having the materials for linings such as our thrushes and larger finches are accustomed to use.

Of the series thirty-one were placed in dense tangles of *Smilax rotundifolia*, or green-brier. None were near the upper or outer edges of the thicket, but usually about one third the distance from its uppermost surface, and midway from side to side: for instance, if the growth was ten feet high and six or eight in width, the home of the mouse would be at an elevation of between six and seven feet; and it had therefore a protecting growth of thorny smilax of three to four feet in extent above it, and nearly the same upon each side.

This was a very uniform feature of the series examined, and, if the mice merely occupy old nests of birds, indicates a uniformity in the matter of their locating by the birds, of which I was not aware, and which I am inclined to doubt.

Again, the smilax was so very dense or closely intertwined, in the majority of instances, that it was clearly impossible for a bird as large as a robin or grosbeak to have penetrated it with that celerity of movement necessary to escape the impetuous charge of a hawk. It is, I think, far more probable that the continuous growth of the green-brier, after the birds abandoned the nest, made it in many cases inaccessible.

During my almost daily visits to these bush-retreats of the white-footed mice, I determined one fact about the density of these growths of smilax, as late as October: that the small hawks, and even smaller shrike, found sparrows and mice quite out of reach when they took refuge therein. In one case, a sharp-shinned hawk, a little more rash than usual, struck at a snow-bird, as the latter dived into some opening in the briers, and, instead of capturing it, the hawk was himself hopelessly entangled.

Four of the forty-two nests occupied by the mice were placed in clusters of blackberry-canes, a growth which proved to be by no means easy to penetrate, but probably would offer no serious obstacle to a determined foe, but certainly could not have been suddenly assaulted—a condition which rendered the occupants comparatively safe.

The remaining seven nests were in a mixed tangle of Virginia creeper and grape-vine. These seven nests were all at a greater elevation than any I found in smilax or other thorn-bearing growths; one nest being thirteen feet from the ground.

These bush-retreats of the mice were all distinctly globular, or globoid, with the entrance usually near the rim of the original structure, and looking downward. These original structures were not merely covered at the top, but distinctly arched over; and the exterior often had a "pulled-to-pieces" appearance that suggested a chance accumulation of twigs and dead leaves, rather than designed.

A careful examination convinced me that twenty-nine were nests of cat-birds, cardinal-grosbeaks, or song-thrushes, and two were nests of the robin; all of which had been built by these birds in May or June of the same year—five or six months previously. The nests of the robin are apparently less popular, on account of the partial or complete mud-lining.

In this series of twenty-nine nests I determined that the foundations and lower portion of the sides, for about one half their extent, were unaltered to any significant extent; and many appeared as if a smaller bird's nest had been bodily removed, inverted, and so used as a roof to the lower structure. Whether the rougher exterior, to which I have alluded, was due to exposure since early summer, to unskillful work on the part of the mice, or a design of these mammals to render the nests less conspicuous, could, of course, not be determined.

Eight of the series were to me quite unlike birds' nests in their construction. The interlacing of the twigs was not like the ordinary work of birds; and the internal capacity of each one of this series was much smaller than that of an ordinary cat-bird's nest; while the exterior measurements were the same or nearly so—thus showing great difference in the thickness of the walls of the structure.

Three of these eight nests I picked to pieces, and the lining proved to be a mass of downy feathers—how they got them is a mystery—and an abundance of the "silk" of the milkweed; this being a material not used by any of the birds I have named, and indeed not ready for use until after bird-nesting is over.

Still, I am not yet prepared to make an *ex-cathedra* statement that these mice do build bird-nest-like structures in smilax and other dense growths, without having at least the base of a bird's nest as a starting-point; yet, why they should not, does not readily appear, when we remember that they build beautifully designed nests in hollow logs, tufts of grass, and under flat stones. Such nests are their ordinary summer homes.

It is certain that the materials for these summer nests, which, as a rule, are on or very near the ground, are often carried from quite distant points; so, why should they not carry them up a few feet into tangled growths, offering almost as sure a footing as the ground itself?

To recapitulate : judging from the number of nests examined—of course, another such series might give different results—the winter retreats or bush-nests of the white-footed mice are usually modified birds' nests ; but in some cases the modification appears to be extended to practically a new construction.

Once within their nests, the white-footed mice are not readily disturbed during the day ; and, unless the smilax or other growth is greatly agitated, they will not even take the trouble to look about them. By gently cutting my way toward the nest with a pair of shears, snipping here and there a branch or two, and drawing others gently aside, I have never failed to successfully surprise the timid occupants in their snug retreats. It is fairly safe, therefore, to conclude that I procured a pretty accurate knowledge of the number of occupants of each nest, the relative proportion of the one to the other sex, and of old and young. Thirty-six nests contained each a female mouse, and of these twenty-two were associated with young able to walk, while the others were burdened with the care of helpless offspring but a few days old. In not a single instance did I find a male mouse in these nests, while in the six other nests each was found to contain a single adult male mouse and no other occupant.

This unsocial condition of affairs seems to me the more strange, as in several nests placed upon the ground—many such nests are occupied the year round—both parents were found. They were not accompanied by any offspring, however ; and it would seem as though a separation took place on the birth of a litter. Such facts tempt one to theorize, but I desist.

It was a pretty sight to see the mice when forced to quit their airy quarters in a thicket of smilax. Be the vine ever so slender, they took no uncertain steps, but tripped lightly down from point to point, and never arriving at a confusing corner. One female mouse turned just twenty times before she reached the ground. Once there, although she had proceeded very cautiously before, she suddenly disappeared. This, indeed, is always the case ; but just where they go when they reach *terra firma* remains to be shown.

The prevalent impression is that every mouse has a subterranean retreat directly beneath the nest in the bushes, and passes from one to the other as fancy dictates. Their actions seem to bear out the truth of this, but I have never been able to discover such underground retreats in positions that conclusively showed they were frequently visited by the bush-dwelling mice above them. On the other hand, I have found the evicted mice to take shelter under dead leaves, pieces of bark, or limbs of trees. If disturbed from such lurking-places, they very seldom attempt to re-enter the elevated bush-nests, but scamper off over the weedy, leaf-strewed meadow.

Besides reconstructing nests of birds as dwellings for themselves, they convert others into magazines stored with carefully selected

acorns, chinkapins, hazel-nuts, and corn; and so there really seems to be no necessity for bush-dwelling mice ever to return to the ground when once they have taken up their quarters in a smilax thicket—that is, return before the winter is over.

In this my experience is quite the opposite to that of others who have found underground retreats beneath the bush-nests, and have seen the mice, when forced to leave the latter, take refuge in them. It is possible, certainly, that these were burrows of the meadow-mouse (*Arvicola riparia*), and it would be hard to prove, in a meadow everywhere tunneled by mice and shrews, that the presence of burrowings, whether deep or shallow, beneath nests in bushes, was not merely a coincidence; and, again, I am quite sure the same tunnels are often used in common by widely different species of small mammals.

The stores of food for winter use are of much interest as connected with the subject of hibernation; but I can at present merely outline what I have seen, and what conclusions I have reached from such observations. It can be truthfully said that, while the white-footed mouse is not a hibernating animal, nevertheless it frequently hibernates. In other words, its prolonged sleeping, sometimes extending over several weeks, depends not upon the temperature, for I have seen them scampering over the snow when the mercury was nearly at zero, but upon their access to the food they have laid up for winter use. Cut this off and they will not starve, but pass into that curious torpid state which, with many mammals, continues for the entire season. I have experimented so frequently with them in regard to this, that I feel warranted in saying that one wonderful capability of the creature is, to be able to avoid starvation and its attendant horrors by *optional hibernation*.

Why, it will probably be asked, do so many of these mice quit their cozy quarters in or on the ground, and which have served them every purpose, and take all this trouble to build a new home in the bushes for the winter? It has been suggested that the nest was worn out, and better fitted for entomological research than for hesperomoid habitation. I had myself thought of this, but have never detected such abundant evidences of this disastrous condition as would warrant the removal; and certainly the fur of these creatures would carry, in all cases, a sufficient number of acari to bring about, in a brief space, a repetition of the plague.

The supposed excessive dampness during autumn and winter of many situations where the summer nests of the mice abound has also been urged as a probable reason for the marked exodus that, as we have seen, occurs on the approach of cooler and wetter weather; but the exposure to sudden summer showers would, in this respect, be more objectionable than the steadier rains and gradual melting of snow during winter; when, as a matter of fact, they are less apt to suffer from water encroaching upon their nests than at other times—the frozen condition of the rough surface tending to carry off the water and pre-

vent its soaking into the ground. I have never found a nest that could not have been better guarded from the damps of winter than from those terrific cloud-bursts that recall the vivid description in Genesis of the Noachian deluge. During such rainfalls, for which the month of August is noted, very many white-footed mice are drowned.

From such scanty observations as I have been able to make, I am led to believe that the habit of such removals from the ground to the bushes has been brought about by the greater exposure to the attacks of enemies, when nesting upon the ground; these enemies being weasels, minks, and crows.

The two mammals I have named are certainly more given to prowling about the haunts of the mice in winter than in summer; and the crows, particularly when the ground is frozen, have often been seen tugging away at the unyielding stones or wood that sheltered such mice as had concluded that their present quarters were so favorably conditioned as to prove effectual against the assaults of whatever enemy might chance to come. The fact that the poor creatures sometimes suffered from an error of judgment led me to conclude that the representatives of the weasel family, that I have mentioned, and the omnivorous and omnipresent crow, are ever eager to capture white-footed mice whenever an opportunity occurs.

Probably years of further observation will prove necessary to clear up this important point of the cause that led to the habit of utilizing abandoned birds' nests; but I have no doubt that the question of comparative safety of the two situations, the ground or a thicket of smilax, had much to do with it.

MANUAL INSTRUCTION.

By Sir JOHN LUBBOCK.

MR. MUNDELLA, in an interesting address which he delivered at the Polytechnic last year, took us Londoners somewhat severely to task because more is not done in the metropolis to provide for the intellectual wants of our people. Certainly I must admit, as a Londoner, that we are far from being as advanced as we could wish. I would, however, point out two reasons. In the first place, the areas of government in London are for many purposes too small. I have no desire to speak disrespectfully of vestries or vestrymen. But take the case of free libraries: London is reproached for having so few, but would Birmingham have had its magnificent library if it were governed by the vestries of the separate parishes? One reason which has defeated the efforts to establish free libraries in London has been that the parishioners have been told that, while the expense would fall on them, readers could come in from other parishes. A bill should be proposed next session to remedy this by amending the Free Libraries

Act in the metropolitan district by making the area that of the union instead of the parish. Again, why have we in our educational institutions so few members and students belonging to the great shopkeeping community? It is on account of the excessively long hours in London shops. This, again, is to a great extent owing to the difficulty in such immense communities of obtaining and securing common action. I hope that next session we may do something to mitigate this great evil. Free libraries and shorter hours in shops are two of the most pressing wants in London. Still, I can not help thinking that Mr. Mundella was rather too severe on us. Can any provincial city show a nobler work than that carried on by Mr. Quentin Hogg at the old Polytechnic Institution? The members and students now, I understand, number nearly ten thousand, and not only does Mr. Quentin Hogg devote an immense amount of time to the work, but the annual cost to him can not be much below £10,000 a year. If it had been in one of our provincial cities we should probably have heard more of it. Londoners are, perhaps, too modest. Our London School Board has done its work efficiently, and is generally blamed for spending too much rather than too little. Again, the stimulus which has been recently given to the cause of technical education in England has no doubt been very greatly due to the City and Guilds of London Technical Institute, so ably directed by Sir Philip Magnus. The Commissioners on Technical Instruction, in their interesting report on technical education, have given endless cases showing the great importance of technical instruction, and I can not help thinking that much more technical education might be introduced even into elementary schools. Something of the kind, indeed, is done in the case of girls by the instruction in needlework and cookery, which latter, I am happy to see, is showing satisfactory results. Why should not something of the same kind be done in the case of boys? There are some, indeed, who seem to think that our educational system is as good as possible, and that the only remaining points of importance are the number of schools and scholars, the questions of fees, the relation of voluntary and board schools, etc. "No doubt," says Mr. Symonds, in his "Sketches in Italy and Greece," "there are many who think that when we not only advocate education but discuss the best system, we are simply beating the air; that our population is as happy and cultivated as can be, and that no substantial advance is really possible. Mr. Galton, however, has expressed the opinion, and most of those who have written on the social condition of Athens seem to agree with him, that the population of Athens, taken as a whole, was as superior to us as we are to Australian savages."

That there is some truth in this probably no student of Greek history will deny. Why, then, should this be so? I can not but think that our system of education is partly responsible.

Technical teaching need not in any way interfere with instruction

in other subjects. Though so much has been said about the importance of science and the value of technical instruction, or of hand-training, as I should prefer to call it, it is unfortunately true that in our system of education, from the highest school downward, both of them are sadly neglected, and the study of language reigns supreme.

This is no new complaint. Ascham, in "The Schoolmaster," long ago lamented it; and Milton, in his letter to Mr. Samuel Hartlib, complained "that our children are forced to stick unreasonably in these grammatick flats and shallows"; and observes that, "though a linguist should pride himself to have all the tongues Babel cleft the world into, yet, if he have not studied the solid things in them as well as the words and lexicons, he were nothing so much to be esteemed a learned man as any yeoman or tradesman competently wise in his mother dialect only"; and Locke said that "schools fit us for the university rather than for the world." Commission after commission, committee after committee, have reiterated the same complaint. How, then, do we stand now?

I see it, indeed, constantly stated that, even if the improvement is not so rapid as could be desired, still we are making considerable progress in this direction. But what are the facts? Are we really making progress?

On the contrary, the present rules made by the Education Department are crushing out elementary science. There are two heads elementary science may be taken under, which are known as "class subjects" or "specific subjects." Under the Code, there are four so-called class subjects, only two of which may be taken. One of them must be English, which I am afraid in a great many cases practically means grammar. Consequently, if either history or geography were selected for the second, elementary science must be omitted. It has been pointed out, over and over again, that the tendency must be to shut out elementary science, because the great bulk of the schools are sure to take history or geography. The last report shows how grievously this has proved to be the case. The President and Vice-President of the Council, in the report just issued, say that elementary science "does not appear to be taken advantage of to any great extent at present." This is a very mild way of putting it. Mr. Colt Williams says, more correctly, that "specific subjects are virtually dead." Mr. Balmer observes that "specific subjects have been knocked on the head." In fact, out of the four and a half million children in our schools, less than twenty-five thousand were examined last year in any branch of science as a specific subject. Take, for instance, the laws of health and animal physiology. Only fourteen thousand children were presented in this subject. Yet how important to our happiness and utility! Neither Mr. Bright nor Mr. Gladstone, I believe, ever learned any English grammar, and, as regards the latter, it has been recently stated, by one who knows him intimately, that the splendid health he

enjoys is greatly due to his having early learned one simple physiological lesson.

Turning again to the class subjects, last year elementary science was only taken in forty-five schools out of twenty thousand. This, however, was not because it was unpopular, but simply on account of the rules laid down in the Code. According to Mr. Williams, grammar—which, under compulsion, was taken in over nineteen thousand schools—was not a popular subject, and, if only the Code permitted it, it would be dropped in half his schools. One of her Majesty's inspectors, in the last report, seemed to regard it as an advantage of grammar that "its processes require no instruments, no museums, no laboratories." This, on the contrary, is one of its drawbacks. It fails to bring the children into any contact with Nature. Indeed, Helmholtz is probably correct in his view, that the rules of grammar, followed, as they are, by long strings of exceptions, weaken the power of realizing natural laws. Again, it is surely undesirable to attach so much importance to the minutiæ of spelling. Dr. Gladstone has shown that the irregularities of English spelling cause, on an average, the loss of more than one thousand hours in the school-life of each child. "A thousand hours in the most precious seed-time of life of millions of children, spent in learning that *i* must follow *e* in conceive, and precede it in believe; that two *e*'s must, no one knew why, come together in proceed and exceed, and be separated in precede and accede; that uncle must be spelled with a *c*, but ankle with a *k*, and numberless other and equally profitless conventions! And this, while lessons in health and thrift, sewing and cooking, which should make the life of the poor tolerable, and elementary singing and drawing, which should make it pleasant and push out lower and degrading amusements, are, in many cases, almost vainly trying to obtain admission." At present, we really seem to follow the example of Democritus, who is said to have put out his eyes, in order that he might reason better. It was a truer instinct which identified the "seer" and the "prophet." It seems very undesirable that our rules should be so stringent as to lay down a "flattening-iron" over schools, but if the choice of subjects were dictated at all, why, of all subjects in the world, should grammar, with its dry and bewildering technicalities, be especially favored? I do not, however, wish to disparage grammar; all I desire is, that it should not block the way; that elementary science should have a fair chance. The three objections which are sometimes heard, especially at school-board elections, are over-pressure, over-expense, and over-education. That there is really no general over-pressure, Mr. Fitch and Mr. Sydney Buxton have satisfied most impartial judges. Still, the relief afforded by a change from literature to science, from books to nature, from taxes on memory to the stimulus of observation, is no doubt of the most grateful character.

Mr. Matthew Arnold, in his recent "Report on Certain Points

connected with Elementary Education in Germany, Switzerland, and France," points out that in German elementary schools there is a "fuller programme" and a "higher state of instruction" than in ours. He takes Hamburg, as a good typical case, and he tells us that "the weekly number of hours for a Hamburg child, between the ages of ten and fourteen, is, as I have said, thirty-two; with us; under the Code, for a child of that age, it is twenty." And then, or I should rather say "but then," "the Hamburg children have, as the obligatory matters of their instruction, religion, German, English, history, geography, natural history, natural philosophy, arithmetic and algebra, geometry, writing, drawing, singing, and gymnastics, thirteen matters in all." In one of our schools under the Code, the obligatory subjects are "three—English, writing, and arithmetic. Of the optional matters, they generally take, in fact, four, singing and geography; . . . and as specific subjects, say, algebra and physiology, or French and physiology. This makes in all, for their school-week of twenty hours, seven matters of instruction." As a matter of fact, I have shown that comparatively few children are presented in any specific subject. But even if two are taken, this would only bring up the subjects to half those included in the ordinary German course. Mr. Arnold "often asked himself" why, with such long hours, and so many subjects, the children had "so little look of exhaustion or fatigue, and the answer I could not help making to myself was, that the cause lay in the children being taught less mechanically and more naturally than with us, and *being more interested.*"

I feel sure there is a great deal in this; variety in mental food is as important as in bodily food, and our children are often tired simply because they are bored.

As to expense, it is really ignorance and not education which is expensive.

But then we hear a great deal about over-education. We need not fear over-education; but I do think we suffer much from misdirected education. Our schoolmasters too often seem to act as if all children were going to be schoolmasters themselves.

It is true that more attention is now given to drawing in some schools; and this is certainly a matter of very great importance, but some changes must be made in the Code before that development can be made which we should all wish to see. Manual work in boys' schools seems to be exactly parallel with, and in every way analogous to, that of needlework in girls' schools, and I am inclined to agree with Sir P. Magnus that the value of the one kind of teaching should be as fully recognized and assisted by the state as that of the other. Why could they not introduce carpentering or something of that sort, which would exercise the hands of the boys as well as their heads? I have myself tried an experiment in a small way in the matter of cobblery, and although the boys did not make such progress as to be

able to make their own boots, they no doubt learned enough to be able to mend them.

The introduction of manual work into our schools is important, not merely from the advantage which would result to health not merely from the training of the hand as an instrument, but also from its effect on the mind itself.

I do not, indeed, suppose that, except in some special districts, we can introduce what is known as the "half-time" system, in the sense that the children will do ordinary work for wages, though Mr. Arnold tells us in his "Report on Certain Points connected with Elementary Education in Germany, Switzerland, and France," that in Prussia "the rural population greatly prefer the half-day school, as it is called, for all the children, because they have the elder children at their disposal for half the day."

I do not, I confess, see why a system so popular in Germany should be impossible in England; but what seems more immediately feasible is that our boys should be trained to use their hands as well as their heads. The absence of any such instruction is one of the great defects in our present system.

Such teaching need not in any way interfere with instruction in other subjects. Mr. Chadwick has given strong reasons for his opinion, "that the general result of the combined mental and bodily training on the half school-time principle is to give to two of such children the efficiency of the three on the long school-time principle for productive occupations."

Again, the Commissioners on Technical Instruction, speaking of schools in the Keighley district, say: "The most remarkable fact connected with these schools is the success of the half-timers. The Keighley district is essentially a factory district, there being a thousand factory half-timers attending the schools. Although these children receive less than fourteen hours of instruction per week, and are required to attend the factory for twenty-eight hours in addition, their percentage of passes at the examination is higher than the average of passes of children receiving double the amount of schooling throughout the country."

In our infant-schools we have generally object-lessons or some more or less imperfect substitutes of that kind for the very young children. But after this, with some rare exceptions, our teaching is all book-learning; the boy has no "hand-work" whatever. He sits some hours at a desk, his muscles have insufficient exercise, he loses the love and habit of work. Hence to some extent our school system really tends to unfit boys for the occupations of after-life, instead of training the hand and the eye to work together; far from invigorating the child in what M. Sluys well terms "le bain refraichissant du travail manuel," it tends to tear his associations from all industrial occupations, which, on the other hand, subsequently revenge themselves,

when their turn comes, by finally distracting the man from all the associations and interests of school-life.

This principle of manual instruction has been elaborately worked out in Sweden, where it is known as the "Slöjd" system, by Mr. Abrahamson and Mr. Solomon, and has been already adopted in over six hundred schools. It has recently been the subject of a very interesting memoir by M. Sluys,* who was deputed by the Belgian Minister of Education to visit Mr. Abrahamson and report upon it. The importance of manual practice as an integral part of all education was long ago realized by the genius of Rousseau, and first worked out practically and as regards young children by Froebel. Basedon indeed, in 1774, introduced manual instruction as a counterpoise to mental work; but Finland seems to be the country where the value of manual instruction as an integral part of education was first realized, when, thanks to the efforts of Uno Cygnæus, the Government enacted in 1866 that it should be an obligatory subject in all primary and normal schools. The system of Basedon appears to have been less successful than might have been expected, probably in great measure because the instruction was confided to artisans, whereas it seems to be of great importance not to separate the direction of the manual from that of the mental training.

There have been, indeed, two very different points of view from which manual instruction has been recommended. The first looks at the problem from a specially economical point of view. The school is arranged so as to elicit the special aptitudes of the pupils; to prepare and develop the children as quickly and as completely as possible for some definite trade or handicraft, so as to, if possible, assure them, when leaving school, the material requisite of existence. In this way, it is maintained, that the wealth and comfort of the nation can be best promoted.

The second theory regards the manual instruction as a form of education; the object is to give to the hand, not so much a special as a general aptitude, suitable to the varied circumstances of practical life, and calculated to develop a healthy love of labor, to exercise the faculties of attention, perception, and intuition. The one treats the school as subordinate to the workshop, the other takes the workshop and makes it a part of the school. The one seeks to make a workman, the other to train up a man. In short, the Swedish system is no preparation for a particular occupation, but is intended as a means of general development. The time devoted to manual instruction is there from four to six hours a week.

Of all handiworks, carpentering has been found most suitable. The work of the smith strengthens the arm, but it does not train the

* "L'Enseignement des Travaux Manuels dans les Écoles primaires de Garçons en Suède." Rapport présenté à M. Le Ministre de l'Institut Publique par M. A. Sluys, et conclusion de MM. A. Sluys et H. Vankalken. Bruxelles, 1884.

hand—tends rather, indeed, to make it too heavy. Moreover, the work is rather hard for children. In basket-work, the fingers alone are exercised; few tools are required or mastered, the younger children can not finish off a basket, and it is an additional disadvantage that the work is done sitting. Bookbinding is too limited and too difficult; moreover, it does not afford sufficient opportunities of progressive difficulty. Work with cardboard is in many respects very suitable, but it trains the fingers rather than the hand, and does not sufficiently develop the bodily vigor. On the whole, then, working in wood is recommended, and it is remarkable that it was long ago suggested by Rousseau:

Tout bien considéré, le métier que j'aimerais le mieux qui fût du goût de mon élève est celui de menuisier. Il est propre, il est utile, il peut s'exercer dans la maison, il tient suffisamment le corps en haleine; il exige dans l'ouvrier de l'adresse et de l'industrie et dans la forme des ouvrages que l'utilité détermine, l'élégance et le goût ne sont pas exclus.

Abrahamson has prepared a hundred models, which the children are successively taught to make, commencing with a very easy form, and passing on to others more and more difficult. The series begins with a simple wooden peg, and the series includes a paper-knife, spoon, shovel, axe-handle, flower-stand, mallet, boot-jack, a cubic décimètre, a mason's level, chair, butter-mold, and ends with a milk-pail.

When the model is finished it is inspected. If unsatisfactory, it is destroyed; yet if it passes muster, the child is allowed to take it home. It is all his own work; no one has helped. It is, indeed, found important that the children should make something which they can carry away, and much stress is laid on the condition that they should make it entirely themselves, from the beginning to the end. If one does one part, and one another, if one begins and another finishes it, neither practically takes much interest in it.

The objects made are all useful. At first, some were selected which were playthings, or merely ornamental, but the parents took little interest in articles of this character; they were regarded as mere waste of time, and have gradually been discarded.

The different objects must be gradually more difficult. When the child is able to make any model satisfactorily, he passes on to the next. He must never be kept doing the same thing over and over again. Useless repetition is almost sure to disgust. The man has to do the same thing over and over again, but the child works to learn, not to live.

Lastly, I may mention that the objects selected are such as not to require any expensive outlay in the matter of tools.

The result, we are assured, gives much satisfaction to the parents, and great pleasure to the children.

A weak point in our present educational system is, that it does not

awaken interest sufficiently to enable children generally to continue their education after leaving school. Yet, in addition to all other advantages, a wise education ought greatly to brighten life. Browning speaks of the wild joy of living; but that is not the sense in which life is ordinarily spoken of by the poets. They generally allude to it in a very different sense, as when Pope spoke of it as "life's poor play," observing in another passage—

"These build as fast as knowledge can destroy,
In folly's cup still laughs the bubble joy";

while Lytton said—

"With each year's decay,
Fades, year by year, the heart's young bloom away."

A well-known hymn lays it down as an incontrovertible proposition—

"Brief life is here our portion,
Brief sorrow, short-lived care."

But this is to a great extent our own fault. Too often we fritter away life, and La Bruyère truly observes that many men employ much of their time in making the rest miserable. Few of us feel this as we ought, some not at all. We see so clearly, feel so keenly, the misery and wretchedness around us that we fail to realize the blessings lavished upon us. Yet the path of life is paved with enjoyments. There is room for all at the great table of Nature. She provides without stint the main requisites of human happiness. To watch the corn grow, or the blossoms set; to draw hard breath over the plowshare; or to read, to think, to love, to hope, to pray—"these," said Ruskin, "were the things that made men happy."

Some years ago I paid a visit to the principal lake villages of Switzerland in company with a distinguished archæologist, M. Morlot. To my surprise I found that his whole income was one hundred pounds sterling a year, part of which, moreover, he spent in making a small museum. I asked him whether he contemplated accepting any post or office, but he said certainly not. He valued his leisure and opportunities as priceless possessions far more than silver or gold, and would not waste any of his time in making money. Just think of our advantage here in London! We have access to the whole literature of the world; we may see in our National Gallery the most beautiful productions of former generations, and in the Royal Academy and other galleries the works of the greatest living artists. Perhaps there is no one who has ever found time to see the British Museum thoroughly. Yet consider what it contains; or, rather, what does it not contain? The most gigantic of living and extinct animals, the marvelous monsters of geological ages, the most beautiful birds, and shells, and minerals, the most interesting antiquities, curious and fantastic specimens illustrating different races of men; exquisite gems, coins, glass, and china; the Elgin marbles, the remains of the mausoleum of the Temple

of Diana of Ephesus; ancient monuments of Egypt and Assyria; the rude implements of our predecessors in England who were coeval with the hippopotamus and rhinoceros, the musk-ox, and the mammoth; and the most beautiful specimens of Greek and Roman art. In London we may unavoidably suffer, but no one has any excuse for being dull. And yet some people *are* dull. They talk of a better world to come, while whatever dullness there may be here is all their own. Sir Arthur Helps has well said: "What! dull, when you do not know what gives its loveliness of form to the lily, its depth of color to the violet, its fragrance to the rose; when you do not know in what consists the venom of the adder, any more than you can imitate the glad movements of the dove? What! dull, when earth, air and water are all alike mysteries to you, and when as you stretch out your hand you do not touch anything the properties of which you have mastered; while all the time Nature is inviting you to talk earnestly with her, to understand her, to subdue her, and to be blessed by her! Go away, man; learn something, do something, understand something, and let me hear no more of your dullness."

Not, of course, that happiness is the highest object of life, but if we endeavor to keep our bodies in health, our minds in use and in peace, and to promote the happiness of those around us, our own happiness will generally follow.—*Fortnightly Review.*

THE INTERMINGLING OF RACES.

By JOHN READE.

ABOUT a generation ago, before anthropology had been promoted to the rank of a distinct science, a good deal of noise was made by a school of writers who called themselves polygenists. By this school, which comprised a few men of recognized ability, it was rigidly maintained that no new race had been, or could be, formed by intercrossing. As the different human species had been created, so they had been found at the dawn of history, and so they would remain till the end of time. The theory of the polygenists, like a good many other subjects of controversy, was gravely affected by the revolution of which the publication of Darwin's great work marked the birth-time. Though it is still possible, even on the ground of development, that the main racial divisions of humanity may have come into being by separate evolutions, on portions of the earth's surface widely distant from each other, it is more in accordance with that doctrine to assume a slow and gradual differentiation from a single original type.

What that type may have been we have no means of ascertaining. Professor Grant Allen has, indeed, imagined "a tall and hairy creat-

ure, more or less erect but with a slouching gait, black-faced and whiskered, with prominent prognathous muzzle, and large, prominent canine teeth," whose "forehead was, no doubt, low and retreating, with bony bosses underlying shaggy eyebrows, which gave him a fierce expression, something like that of a gorilla"; and that such a creature existed in far-off prehistoric times Mr. Allen considers "an inevitable corollary from the general principles of evolution."* We may have some notion of what such a rough-cast of humanity would look like from the ideal representation of the Neanderthal man which forms the frontispiece to Mr. J. P. McLean's "Manual of the Antiquity of Man." But, whatever may have been the character of the early type, or however the subsequent divergence from it may have arisen, it is sufficiently established that, between the third and second millennium before the Christian era, the several races—black, brown, yellow, and white—had assumed the distinguishing marks by which they are still known. And, no sooner do we meet with evidence of racial diversity, than we begin to discover indications of race intermixture. The ancient Egyptians, who furnish us with such interesting examples of the human varieties of their time, were themselves a people of mixed blood. Nor in that respect were they singular. If, starting from that meeting-place of nations and tongues, the Nile Delta, we traverse the adjacent continents to their utmost limits, everywhere on the route, from Aino-peopled Japan to the Pillars of Hercules, we shall be confronted by the testimonies of interfusion of blood. Even races that seem most homogeneous, like the Chinese, or that have taken pride in avoiding the taint of alien mixture, like the Aryan Hindoos, or, like the Israelites, deemed themselves interdicted by the Divine command from intercourse with foreigners, have been proved beyond a doubt to be of composite origin. To deal separately with those various families of mankind as the dawn of history discloses them to us, or as the centuries of its short range have left them, would take up much time. The general result is, however, well set forth in a passage which I may be permitted to quote from "The Human Species" of M. de Quatrefages. "In China, and especially in Japan," says that distinguished ethnologist, "the white allophylian blood is mixed with the yellow blood in different proportions; the white Semitic blood has penetrated into the heart of Africa; the negro and Houzouana types have mutually penetrated each other and produced all the Caffre populations situated west of the Zooloos of Arabian origin; the Malay races are the result of the amalgamation, in different proportions, of whites, yellows, and blacks; the Malays proper, far from constituting a species, as polygenists consider them, are only one population, in which, under the influence of Islamism, these various elements have been more completely fused. I have

* "Who was Primitive Man?" in "The Fortnightly Review," and "The Popular Science Monthly," November, 1882.

quoted at random the various preceding examples, to show how the most extreme types of mankind have contributed to form a certain number of races. Need I insist upon the mixtures which have been accomplished between the secondary types derived from the first? In Europe what population can pretend to purity of blood? The Basques themselves, who apparently ought to be well protected by their country, institutions, and language, against the invasion of foreign blood, show upon certain points, in the heart of their mountains, the evident traces of the juxtaposition and fusion of very different races. As for the other nations, ranging from Lapland to the Mediterranean, classical history, although it does not go back for a great distance in point of time, is a sufficient proof that crossings are the inevitable result of invasions, wars, and political and social events. Asia presents, as we know, the same spectacle; and, in the heart of Africa, the Gagas, playing the part of the horde of Genghis-Khan, have mixed together the African tribes from one ocean to the other."*

Turning now from the past to the present, let us briefly inquire whether, where, and to what extent the intercrossing of the human races is going on in our own generation. And let us begin with our own hemisphere.

In a recent article in this magazine,† Professor Rudolph Virchow directed attention to what he terms "a delicate ethnological problem"—"the peculiar physiology of the Yankee." "That type," he says, "is not wholly comparable either with the English or the German, or with a cross of the two with the Irish race." He implies, rather than asserts, that its distinctive features are due to the transforming influence of climate, nor does he hint that it might be the result of a tinge of aboriginal blood. In another portion of the same paper he expresses the belief that, however mixed, the population of the United States must remain Aryan at bottom, heterogeneous elements being absorbed without leaving a trace. The problem is certainly interesting, even if we have regard merely to the stage of development that has been reached, and study American characteristics as compared with those of any of the European races that have had a share in the making of the nation. But its interest is intensified when we survey the scattered groups—white and black and red and yellow—whose amalgamation into one vast community may be the work of years to come.

The opinion prevails that north of the Gulf of Mexico the fusion of European and Indian blood has hitherto been extremely rare. Dr. Daniel Wilson believes, on the other hand, that, to a great extent, what has been taken for the extinction of the Indians has been simply their absorption, and that "they are disappearing as a race, in part at least, by the same process by which the German, the Swede,

* "The Human Species" ("International Scientific Series"), pp. 273, 274.

† "Acclimatization," in "The Popular Science Monthly," February, 1886.

the Irishman or Frenchman, on emigrating to America, becomes, in a generation or two, amalgamated with the general stock."* Nor is it on the frontier settlements alone that he has observed the evidences of such interfusion. "I have recognized," he says, "the semi-Indian features in the gay assemblies at a Canadian Governor's reception, in the halls of the Legislature, among the undergraduates of Canadian universities, and mingling in selectest social circles." Dr. Wilson says, moreover, that "in Lower Canada half-breeds, and men and women of partial Indian blood, are constantly met with in all ranks of life," and cites with approval the opinion that "in the neighborhood of Quebec, in the Ottawa Valley, and to a great extent about Montreal, there is hardly among the original settlers a family in the lower ranks, and not many in the higher, who have not some traces of Indian blood."

M. Benjamin Sulte, on the contrary, indignantly denies that the early Canadians intermarried (except in rare instances) with the Indian tribes.† On this point, Abbé Tanguay, than whom no one should be better fitted to pronounce judgment on such a question, makes the following remarks: "For many years the proportion of women to the male immigrants was extremely small. The Carignan regiment alone added fifteen hundred to the population. Did those young soldiers marry native women, and are we to reckon the latter among our ancestors? Some of the colonists did certainly marry native girls, but those girls had been educated and civilized in the institutions of the Hôtel-Dieu and the Ursulines. We can cite several of the most respectable families in Canada who number among their progenitors the sons of the forest, and who should be proud to do so. Among others may be mentioned that of the late Commander Jacques Viger, one of whose ancestors was a daughter of Arontio, the disciple of Father Brebœuf, and like him a martyr to the faith. Nevertheless, we must regard such alliances as exceptional."‡

In the foregoing quotation Abbé Tanguay indicates the cause to which, in frontier settlements, the union of whites and squaws is mainly to be attributed—the dearth of white women. It was under the stress of such a famine that the half-breed population of the Canadian Northwest, which has of late been so much before the world, grew to its present proportions. Its history carries us back to near the beginning of the eighteenth century. Arthur Dobbs, whose account of the countries adjacent to Hudson Bay was published in 1744, obtained his information almost wholly from a half-breed trader called La France—a proof that the *métis* was not unknown a century and a half ago. The explorations of the Verandryes, father and sons, lasted from 1731

* "Prehistoric Man," vol. ii, pp. 250–253.

† "Histoire des Canadiens-Français," vol. i, p. 154.

‡ "Les Familles Canadiennes," in "Transactions of the Royal Society of Canada," vol. i, section i, p. 43.

to 1754. After the conquest of Canada by England, the fur-trade ceased for some years; but in 1766 the Montrealers began to push northwestward, and from that time their agents, mostly French-Canadians, mingled freely with the Indians—the consequence being the growth of a half-breed community. There was a considerable population, known by their chosen designation of *Bois Brulés* (for which they sometimes substituted the more ambitious style of "the new nation"), when Lord Selkirk began his scheme of colonization in 1811. That even then they were not all French is shown by some of their surnames being Scotch or English. But it is from the years immediately following the establishment of the Red River Colony that the bulk of the English-speaking half-breeds date their first appearance. In the year 1814 they numbered two hundred. In 1870 the Manitoba half-breeds and *métis* (as those of British and French origin may be distinguished) were estimated at ten thousand. Besides them, there was a population of uncertain number scattered through the Territories, and a tribe of half-breed hunters which one early explorer deemed to be six thousand strong. In 1874 Dr. G. M. Dawson, while engaged in the British North American Boundary Commission, came upon the camp of the latter body, consisting of two hundred buffalo-skin tents and two thousand horses.* Dr. Wilson considers the rise in this way of an independent tribe of half-breeds as "one of the most remarkable phenomena connected with the grand ethnological experiment which has been in progress on the North American Continent for the last three centuries." The half-breeds, who were given to the chase, have been credited with courage, discipline, and self-control. Those of French paternity are said to be more lively and frank, and physically stronger; those of British origin, the more stable and industrious. The Rev. Professor Bryce, of Winnipeg, says that "like all savage races, the *Bois Brulés* are fickle. They must be appealed to by flattery, by threats, or by working upon their animosities or well-known dislikes, if they would be led in any particular direction"†—and the truth of this characterization was painfully exemplified in the recent rebellion under Riel, no less than in the sanguinary conflict into which they were seduced in 1816. Now that the force of circumstances has subjected them to the restraints of civilization, the likelihood is that they will eventually become merged in the dominant race. Some of them have proved themselves well able to compete with white rivals for the prizes of life. A few of them have achieved success, not only in business and the professions, but in the more trying arena of politics; and, at the very time when the unfortunate Riel was expiating his crimes on the scaffold, a more worthy sharer in the blood

* "Report of the Geology and Resources of the Region in the Vicinity of the Forty-ninth Parallel, from the Lake of the Woods to the Rocky Mountains," etc. (British North American Boundary Commission.) By G. M. Dawson, pp. 295, 296.

† "Manitoba: its Infancy, Growth, and Present Condition," p. 204.

which gave him his ill-omened influence was Prime Minister of Manitoba.

Is there not some reason to believe that the seemingly episodic phenomenon which we have been contemplating is exceptional in degree rather than in kind; and that, much oftener than has been vulgarly supposed, in the advance westward of the American pioneer, he has made the dusky belle of the wigwam the partner in his toils and the mother of his children? For several reasons, some of them obvious enough, records of such unions are not easily obtainable. In census returns, one origin only is given. A person may choose to be set down as of European or Indian extraction, but he can not have paternity and maternity both specified; and, as to any remoter pedigree, the inquirer is left entirely in the dark. It is only in those rare cases where a half-breed has obtained prominence or notoriety, and comes to have his biography written, that the student of ethnology is enabled to add another to his repertory of instances. But, if the inquirer had only leisure and means enough to visit the border-lands of promise, he would be almost sure to glean facts that would surprise the incredulous. Miss Theodora R. Jenness, in telling her experience of a brief stay in the Indian Territory, makes frequent mention of mixed marriages and of the offspring thence resulting. Of well-behaved whites who wandered thither in search of fortune, she writes, "If a man goes there unmarried, he is apt to find a help-meet in an Indian maiden, there being many among the Cherokees and Choctaws who, for beauty and intelligence, compare favorably with any ladies in the States."* She describes the upshot of a law passed in one of the Indian councils requiring all single white men to leave the colony, as "a lively skirmish after wives by bachelors and widowers whose business interests required them to remain." That the ladies who were, like Barkis, willing, were not unworthy of their suitors, Miss Jenness is quite assured. The fair Choctaw, who explained the *ruse* to her, she characterizes as "a sprightly lady, whose charming face and perfect grace would render her an ornament in any society of Boston or New York." In the distribution of cultivated lands among the Cherokees we find fifteen hundred acres allotted to the full-bloods, three thousand to those of mixed blood, and twelve thousand to the whites; but from these figures we can only conjecture the relative number of each category. It is evident, however, that the half-breeds are an appreciable element in the community. Among them allusion is made to the grand-niece of a commodore and niece of a senator, to whom Miss Jenness was introduced by "a blue-eyed Indian girl who taught languages, philosophy, and the higher mathematics," but had forgotten the use of her mother-tongue. The names of Ross, Adair, and Boudinot among the Cherokees, and of McIntosh, Grayson, Porter, and Stidham, among the Creeks, prepare us for the announcement that

* "Atlantic Monthly," April, 1879.

the bearers of them are of mixed lineage. They all hold positions of honor in their respective nations, and their peers among the Choctaws and Chickasaws were likewise of twofold origin. "This harmonious blending of the two races, it seems to me," comments Miss Jenness, "is the great solution of the Indian question as regards the five civilized tribes, which with the rising generation will do away with prejudice, and establish peace and good-will between the whites and Indians." That humane hope would be more reasonable if the artificial barriers which keep the races apart could only be removed; but half-breeds that remain amid Indian surroundings and influences, however cultured they may be, are sadly tempted to relapse into the habits of savage life. It is only when the bride is carried far away from her father's house and people that she and her children form lasting ties of affection with their white kindred. Then, like some of the descendants of Pocahontas, they may reflect credit on both sides of their ancestry. Miss Jenness's narrative indicates, however, in what way and to what extent the blood of both whites and Indians may have been modified in the course of forgotten generations.

A good deal has recently been written on the negro's destiny in the United States. Slavery is of the past, but it has left its Nemesis behind, and the problem calls urgently for solution. Some of the more philanthropic of the *ante-bellum* abolitionists did not hesitate to counsel amalgamation as the true key to it. The late Wendell Phillips, in one of his outbursts of eloquence, spoke of that "sublime mingling of the races which is God's own method of civilizing and elevating the world." Bishop Haven felt confident that Americans would one day see "Helen's beauty in a brow of Egypt." The Rev. George Rawlinson, the historian, is also in favor of race-fusion. But Bishop Dudley, who has had opportunities of looking at the question from a nearer point of view, thinks that, in their actual condition, union with the blacks would be ruinous to the whites. And yet, what he can not accept as a doctrine for the present may, he admits, be received by generations still unborn as in the natural course of things. "What may come," he writes, "in the far-distant future, when by long contact with the superior race the negro shall have been developed to a higher stage, none can tell. For my own part, believing, as I do, that 'God has made of one blood all the nations of men,' I look for the day when race peculiarities shall be terminated, when the unity of the race shall be manifested. I can find no reason to believe that the great races, into which humanity is divided, shall remain forever distinct, with their race-marks of color and of form. Centuries hence, the red man, the yellow, the white, and the black may all have ceased to exist as such, and in America be found the race combining the bloods of them all; but it must be centuries hence. Instinct and reason, philosophy, science, and revelation, all alike cry out against the degradation of the race by the free commingling of the tribe

which is highest with that which is lowest in the scale of development."*

But such commingling seldom, if ever, takes place from deliberate choice on the part of the reciprocating races; nor, indeed, are many marriages the result of calculation regarding their issue. If, early or late, the nations of the United States are destined to coalesce, the coalition will come about not with observation, but through the gradual and almost imperceptible obsolescence of prejudices.

There is one point which, in dealing with the subject of miscegenation on this continent, has hitherto received meager attention—the diversity of the stocks from which the African emigration to America has been derived.† Some of them were more distinct from others than the Spaniard from the Norwegian or the German from the Italian. With several of them there came, no doubt, a considerable share of darkened Semitic blood, while others could claim kindred with races that had won power and renown while Europe was yet in barbarism. Apart from any consideration of white admixture, there has, therefore, been an interblending of dusky tribes which must have materially modified Africa's contribution to the population. As for the more serious question of its relations to the Aryan element there is, as already intimated, difference of opinion. According to the census of 1880, the colored population of the United States was 6,577,497, that of the whites being 43,402,408. During the ten years from 1870 to 1880 the ratio of increase in the former (34·8 per cent) was larger than it had been during any decade except one, that from 1800 to 1810. The fact that the ratio of increase of the white population during the period from 1870 to 1880 was only 29·2 per cent, according to the census, naturally occasioned comment and even alarm. In "The Popular Science Monthly" for February, 1883, Professor E. W. Gilliam, in an article on the subject, based on the statistics of the last two censuses, maintained that the colored people were increasing at a rate which, unless prompt measures were taken to prevent it, would result in the inhabitants of the country becoming Africanized. Mr. Henry Gannett, in a recent contribution to the same journal, disputes the data on which Professor Gilliam founded his argument, and denies that the negroes, either in the cotton States or in the country at large, are increasing so rapidly as the whites, and holds that the fear entertained of the latter being ultimately outnumbered is entirely groundless. Nevertheless, even if the colored people were pretty evenly dispersed through the States, the proportion is large enough to cause uneasiness to those who think that their absorption would not improve the nation. As it is, while, since the close of the war, the tend-

* "How shall we help the Negro?" in "The Century," June, 1885.

† On this point see "The Dance in Place Congo," by George W. Cable, in "The Century," February, 1886; and "Race and the Solid South," by Cassius M. Clay, in the "North American Review," same month.

ency has been rather to drift apart, there has, on the other hand, been no strong inclination on the part of the freedmen to abandon the South. What Mr. Cable calls the "vast, vague afrite of amalgamation," which was once a real power in the land, seems, through the repulsion born of conflict and changed relations, to have lost its potency for either good or evil. Mr. Cable accounts for its absence in the North by insisting that the Northerners were guided not by instinct, but by "the better dictates of reason and the ordinary natural preferences of like for like."* Has the reign of reason begun in the South also? Or, as political antipathies grow feeble, will the Caucasian fastidiousness that grew strong with them also languish and fade? At any rate, some of the best men in the South, as in the North, are standing out courageously for the removal of all degrading disabilities from the colored people, and freeing them from the bondage of restrictions that debase them in their own eyes and in the eyes of the world. If Bishop Dudley's vision of the future be prophetic, and the day be coming, though still far off, when there shall be no more, except as occasional visitants from other lands, either white or black, or red or yellow, within the enlarged confines of the world's great republic, then it is only reasonable that the forefathers of the race that is to be should be at liberty to make what alliances please or suit them without being called to account for doing so. There is little danger of the transformation taking place too rapidly, but no excommunications will retard it, if it is to be. As the Hon. Cassius M. Clay says on this very subject, "Here, as elsewhere, we rest upon the survival of the fittest, and we shall see what we shall see."

The presence of the Chinese on this continent adds still further to the complications of the race problem. That, where they obtain a hold in a white community, intermarriage ensues has been shown by the recent census of Victoria, Australia, where one hundred and sixty persons were returned as half-castes. In the report of the commission appointed by the Canadian Government for the purpose of inquiring into the whole subject of Chinese immigration, Dr. Stout, of San Francisco, testifies that such unions had taken place there. Whether the measures adopted for the exclusion of the Chinese will permanently arrest the incoming tide is very doubtful. That the superfluous hordes of Mongols and Tartars will once more cross the limits of race and invade, with force resistless, the strongholds of Western civilization, is the belief of men who are far from being mere dreamers. Though that deluge may not come in our day, plain forewarnings of its approach are not wanting. China has already entered on the path of railway enterprise, and, when the extension of means of communication shall have shortened the overland route to Europe, the drama of Attila may be re-enacted in a new form.

* "The Silent South" in "The Century," September, 1885.

M. de Quatrefages sets down the proportion of mixed blood in Mexico and South America at one fifth of the whole population. The "Statesman's Year-Book" for 1886 makes it much larger. In Mexico, with a population of over ten million, it is calculated that not more than twenty per cent are of pure European descent, while those classified as Indian number above three million and three quarters. In Guatemala, Honduras, Nicaragua, San Salvador, and Costa Rica, the vast majority of the people are Indians and *mestizos*, so that, if the scheme of Barrios had succeeded, he would have practically ruled over a federation of half-breeds. In the society of the cities only a mere sprinkling pretends to pure Spanish descent. In South America the mixed races are still more numerous in comparison with the rest of the population. In Brazil the colored slave or freedman element has mixed with both creoles and Indians. In Hayti and San Domingo the blacks are the ruling race. In Venezuela whites and blacks have coalesced with Indians to such an extent that, with the exception of about a thirtieth part of the population made up of savage aborigines, the great bulk of the nation is mixed. In Peru it is expected that before long the country will have reverted to the aboriginal condition, only about two per cent of the inhabitants remaining unaffected by Indian or negro admixture. Though in some South American states, such as Chili and the Argentine Confederation, immigration tends to keep up the supply of European blood, in no case is it in the ascendant.

M. d'Omalius has reckoned the number of half-breeds in the world at eighteen million, his computation taking account only of the products of crossing of the European and colored races. But, if what has been said of the proportion of half-breeds to the entire inhabitants of the New World alone be correct, it comes far short of the reality. For obvious reasons it would be difficult to obtain trustworthy statistics concerning the distribution of pure and mixed blood in a community where mixture is a mark of inferiority. Half-breeds, fair enough to pass for whites, would not be likely to volunteer the correction of misconception as to their origin. The degree of dark admixture is, therefore, more likely to be understated than overstated.

While this continent offers to the inquirer the most interesting and numerous examples of new ethnic varieties created by intercourse between different races, others to be found elsewhere are well worthy of attention. In the Sandwich Islands there are the offspring of natives and foreigners of almost every nationality from English to Chinese. Some of the Hawaiian-British half-castes are intelligent, well-conducted, and industrious. The ruler of the kingdom, who recently traveled through Europe, is an accomplished gentleman, as well as a statesman-like and progressive prince. When it is recalled that little more than half a century ago the Hawaiian group was peopled by savages, meet descendants of Captain Cook's murderers, the present condition of the kingdom, with its educated and law-abiding citizens, is

one of the most striking testimonies that modern history affords to the benefits which the dark places of the world have derived from well-directed missionary labor. Tahiti, the capital of which is described as a miniature Polynesian Paris, is another instance of successful missionary and colonizing enterprise, and equally remarkable has been the transformation which the establishment of British rule has effected in Feejee. Unhappily, the contact of even the best civilization with aboriginal races is not always a boon to the latter. The Maoris, one of the finest of the dark-skinned occupants of Polynesia, have dwindled away in the hopeless struggle with an aggression which they were not strong enough to resist and were too proud to conciliate. Neither in their native New Zealand, nor in the lost heritage of the far inferior Australians, has a half-breed population sufficiently large to affect the destiny of the colonies as yet sprung up. To what extent the presence of convicts in New Caledonia has affected the half-breed problem, a writer in "L'Expansion Coloniale" gives us some means of judging. M. P. Joppicourt, in a clever contribution to that journal, presents a striking though melancholy picture of the *popinées*, or native companions of the French settlers or pardoned criminals. While the rare Frenchwomen, who have ventured to share the discomforts and perils of such an exile, are petted and courted in Noumea (the capital of New Caledonia), away off in the bush the poor, faithful *popinée* hugs with rapture the white man's child of which she is the proud and loving mother. She looks upon her husband as her master, and does homage to her offspring as of a superior race. For their sake she has severed herself from her tribe, and refrains from the use of her own language, lest her little ones should be thereby degraded. Her kindred have turned against her as a renegade, but she minds not their reproaches. Alas! a day comes when they have their revenge, when the white man closes his door against her and bids her begone. She has served his purpose, and he needs her no longer. He is paying suit to a countrywoman of his own, and the *popinée* must get out of the way. And so, with misery in her heart, she betakes herself with her children back to the tribe, where for a long time she must put up with taunts and every humiliation. But she, too, has her revenge. By-and-by love changes to bitterness, and his children learn to hate the name and race of the father who has disowned them. When the cry of war is raised, they are the most eager to sink their battle-axes in the white man's skull, to burn his farm, to massacre his wife and children. And thus the innocent and good pay with their lives for the craven treachery of a heartless wretch. Let us hope that the picture is not representative, but exceptional. The same writer seems to see in the half-breed some ground of hope for the future of a colony avoided by the luxurious ladies of France. "Has not South America," he asks, "been entirely peopled by the crossing of Spaniards and Indians? Yes: those *mestizos* have formed powerful and respectable

nations. And in North America, too, it was by allying themselves with the willing daughters of the Abenakis that the sons of France created that vigorous Acadian stock whose patriotic spirit has more than once kept at bay the proud rulers of Old and New England. 'What a pity,' said the Indians after the capitulation of Quebec, 'that the French were conquered! Their young men used to marry our daughters.' Those mixed marriages gave us faithful allies, and enabled our colonists, abandoned by the mother-country, to make head for a century against the inexhaustible forces of Great Britain."* In like manner may the *popinée*, he thinks, prove the main-stay of France in the Pacific.

There is no more romantic and extraordinary instance of a new human variety starting into life, and, in spite of deplorable beginnings, taking on the better characteristics of the wild and the civilized race, than that of the Pitcairn-Islanders. The story is well known, and I need scarcely repeat it. It may suffice to say that, after the tragedy of the Bounty, the refugee mutineers, nine English sailors, accompanied by six men and fifteen women of Tahiti, settled on that little secluded islet. By feuds of race the colony was reduced in four years to four white men and ten Tahitian women. A few years later, Adams, the pious patriarch of the community, was the sole survivor of the repentant mutineers. But, meanwhile, children had been born, who grew up and married and had families, and in 1830 the population of the island was eighty-seven. Some of them were then transferred, at their own desire, to Otaheite, but they had been religiously trained, and the loose morals prevalent there disgusted them. So most of them returned home within the year. In 1856 a second experiment at emigration was made, Pitcairn proving too small to support the rapidly growing population. But Norfolk Island was nearly as distasteful to the half-breeds as Otaheite had been, and in a few years they had almost all come back. When Admiral de Horsey visited the colony in 1878, he found sixteen men, nineteen women, twenty-five boys, and thirty girls—in about sixteen families. At that time the elected governor was James Russell McCay, steersman of the island whale-boat, of which he was also the builder. The law of the land was the simple, but morally rigorous, code drawn up by Adams. The colony, as the admiral described it, was a community of contented, friendly, gentle, pious people, poor but happy, strict in attending to their religious duties, and taking their recreation mainly in the form of music, most of them being good singers. A later visit to Pitcairn of an English vessel was some time ago described in the London "Daily Telegraph."

The communities of half-breeds to which I have been directing attention are mainly composed of English, French, or Spanish, blended

* I would like to know where M. Joppicourt obtained his information concerning the frequency of mixed marriages in Canada under the old *régime*.

with some colored race. The Portuguese, like their neo-Latin kinsmen, have ever been known to mingle their blood with that of aliens in all parts of the world. In Brazil, on this continent, they are largely represented in combination with both the Indian and the negro, while instances are not wanting in which the blood of the three is blended in various proportions. In Africa the same people has mixed with the natives of both the east and west coasts. In Asia, though none of their colonies are large, compared with those of England, their position was one of influence before the stream of exploration had drawn other nationalities eastward. The Malay word *mandarin*, so associated in our minds with the despotic system of the extreme Orient, was one of the prizes of early Portuguese exploration, and it is one of several terms and phrases which the daring countrymen of Camoëns have, by origination or adaptation, caused to pass current in the whole world of commerce and diplomacy. Even in lands where their influence has waned, the vestiges of their former power remain in the language of the people. On landing at Batavia in the autumn of 1878, Mr. H. O. Forbes heard here and there, amid the Babel of foreign tongues that assailed his ears, "a Portuguese word still recognizable, even after the changes of many centuries, veritable fossils imbedded in the language of a race, where now no recollection or knowledge of the peoples who left them exists." And at a later date, while visiting the shops and offices of Dilley, in Timor, he was astonished "to find all business conducted, not as in the Dutch possessions, in the *lingua franca* of the Archipelago, Malay, but in Portuguese." * Where the Portuguese have imposed their language, it is only to be expected that they have to some extent mingled their blood with that of the people who speak it. In Goa, Hindostan, Macao, China, famous from its association with Camoëns, and in the scattered insular possessions of Portugal, as well as in other parts of the East, there is a considerable population of Portuguese half-castes. Among the six millions of the Philippines, Spanish *mestizos* are also numerous. In Manila, the capital, they form a considerable proportion of its population of one hundred and eighty thousand. Of people of Dutch mixed with native blood there must be a good many in the Dutch East Indies. The Griquas of South Africa form, however, the most interesting example of a Dutch half-breed community. In Japan there is also a population of partially Dutch descent. Intermarriage between the ruling and the subject race in Hindostan, though not so frequent as it would be in like circumstances if any of the neo-Latin races held the position of the English, is by no means unknown, nor, where the social conditions are on a par, is there any degradation attached to it. Ceylon furnishes many examples of mixed blood, the European element being Dutch, Portuguese, or English. The extent to which the East and West have amalgamated west of the Arabian Sea it is impossible to say, but, if

* "A Naturalist's Wanderings in the Eastern Archipelago," pp. 6, 417.

the truth were known, it would, perhaps, surprise the sticklers for Caucasian exclusiveness. Travelers are constantly meeting with Europeans of almost every nation in out-of-the-way corners of the world, where they have made themselves homes and taken them wives of the daughters of the land. When in 1836 the late Charles Darwin and Captain (afterward Vice-Admiral) Fitz-Roy visited the Cocos-Keeling group in the Indian Ocean, they were surprised to find that Mr. J. C. Ross, with a *familia* of Orientals, had taken up his abode in those lonely islets. Yet Mr. Ross himself had been no less surprised to discover that another adventurer, Mr. Alexander Hare, had anticipated him. When Mr. H. O. Forbes visited the islands in 1878, he found Mr. Ross's grandson still in possession and quite happy in his self-imposed exile from civilization. The inhabitants on the last occasion were found to be nearly all of mixed blood, the proprietor himself having married a Cocos-born wife.*

If it would not tend to prolong this essay indefinitely, many more instances might be recorded. There is hardly a portion of the East in which abundant evidence is not obtainable of the mixture of race already accomplished or now going on. The Malay Peninsula, Burmah, Siam, Cochin-China, Hong-Kong, the seaport cities of China and Japan, besides the countries already mentioned or alluded to, furnish testimony to the fact enough to satisfy all who seek information on the subject. The following picture of the racial variety to be met with in an Eastern city shows, at least, what opportunities exist for intermixture: "The city is all ablaze with color. I can hardly recall the pallid race which lives in our dim, pale islands, and is costumed in our hideous clothes. Every costume from Arabia to China floats through the streets: robes of silk, satin, broadcloth, and muslin; and Parsees in spotless white, Jews and Arabs in dark, rich colors—Klings (natives of Southern India) in crimson and white, Bombay merchants in turbans of large size—and crimson cummerbunds. Malays in red sarongs, Sikhs in pure white, their great height rendered almost colossal by the classic arrangement of their draperies, and Chinamen from the coolie, in his blue or brown cotton, to the wealthy merchant in his frothy silk *crêpe* and rich, brocaded silk—made up a medley irresistibly fascinating to the stranger." † Such is Singapore, and not far off is Malacca, one of the oldest European towns in the East, originally Portuguese, then Dutch, and now, though nominally under English rule, practically a Chinese colony. Not less striking is Mr. Forbes's sketch of a street-scene in the capital of Portuguese Timor: "Tall, erect indigenes mingle with negroes from the Portuguese possession of Mozambique and the coasts of Africa, most of them here in the capacity of soldiers or condemned criminals; tall, lithe East Indians from Goa and its neighborhood; Chinese and Bugis of Macassar, with

* "A Naturalist's Wanderings," etc., pp. 13–20.

† Isabella Bird, in the "Leisure Hour."

Arabs and Malays and natives from Allor, Savu, Roti, and Flores; besides a crowd in whose veins the degree of commingledness of blood of all these races would defy the acutest computation." * The Timorese themselves represent the Malay, the Papuan, and the Polynesian races. But they also offer exceptions which can not fail to strike the beholder with wonder. For instance, the same author writes: "While in the act of turning from watching this human hunt to continue my journey, my eye lighted on an object that riveted my interest more than all else among those savage marketers—a red-haired youth, first one, then a few others, some with straight, some with curly hair, with red eyelashes, blue eyes, and the hair over their body also reddish. I found, on inquiry, that a little colony of them, well known for their peculiar color of hair and eyes, lived at Aitûha, at no great distance off. Though they lived in a colony together, they were not shunned by their neighbors, who even intermarried with them. The offspring of these unions took sometimes after the one, sometimes after the other parent. In looking eagerly at their faces, I saw more than their features only; their presence there was an excerpt out of a long history. In imagination I saw past them down the dim avenues of Time—a far, far cry—to their early progenitors, and pictured their weary retreat, full of strange and romantic vicissitudes from a more northern clime, till forced off the mainland by superior might into exile in this remote isle, where, as a surviving remnant amid its central heights, they are living united, but not incorporated with the surrounding race whose pedigree has no link in common with their own." †

Space will not permit me to more than allude to the race-mixtures of Hindostan and its border-lands, of the Afghan frontier uplands, where Mongoloid and Caucasian still contend for the mastery,‡ of the important region once swayed by the scepter of Darius, of the lands of the Sultan, of the many-tongued realm of the Czar, and the long, deep range of Arab conquest in Africa.

Of what blood-fusion did for that part of the world, the broad seat of successive empires in the distant past, I have already briefly spoken. And the transformation is still going on. The sons of Joktan and Ishmael, with the Koran in their hands, have been trying for ages to convert the dark tribes of Africa to the creed of the Moslem, and, in preaching their gospel, they have not disdained to share their ancient lineage with their dusky disciples. Arabic scholars have, by the cruel fortunes of the slave-hunt, found themselves enthralled to Brazilian

* "A Naturalist's Wanderings," etc., p. 418. † Ibid., pp. 464, 465.

‡ Mr. A. H. Keane ("Nature," January 8, 1885) divides the North-Afghan tribes into Caucasic and Mongolic; and, again, the former into Galchas and Iranians, and the latter into Mongols and Tartars. The Galchas are subdivided into Siah-Posh, Badakshi, Wakhi, and Shugnaris; the Iranians into Kohistani, Firuz-Khoi, Jemshidi, Tajiks, and Afghans. The Mongols are composed of Hazarahs and Airnaks, and the Tartars of Salor-Turkomans and Kataghani Uzbecks. The Caucasians number something over a million, and the Mongols over a million and a quarter.

half-breeds, their protests availing nothing against the evidence of their skins.* Whether the crusade inaugurated and sanctioned by the powers that constituted the Congo Free State will prove a more successful civilizer than the Arab's mission remains to be seen. If it fails to blanch the negro's skin, it may, and it is to be hoped that it will, liberate his mind from superstition and prejudice by its higher teaching and example.

SCIENCE IN RELIGIOUS EDUCATION.

By DANIEL GREENLEAF THOMPSON.

I.

THE interest of the community that its growing youth become good citizens, extending as it does almost to a necessity for self-preservation, has developed a system of public education, supported by taxation, like any other instrumentality of government. Besides this there are a great many institutions, particularly of a higher grade, which are of a private or perhaps semi-public character, maintained beyond tuition fees chiefly by individual gifts and bequests, but sometimes also by state aid in addition. Education in such schools of the one class and the other, rather than family education, it is the present purpose to consider with reference to the leading topic.

The maintenance of the social order depends upon the needs of mankind in this world; not upon their desires, their wants, their speculations regarding a life to come. To be sure the interests of men in the latter do influence their conduct in the present life and thus affect their character as citizens. Hence the religious creeds of its members are not matters of indifference to the community. At the same time the great heterogeneity of opinions and faiths makes it a perplexing question how to legislate for the common weal in such personal concerns as that of religion. But yet it may be urged with force that, if we waited for universal agreement before we taught anything, the instruction given in every department would be very scanty.

About all the higher studies, such as philosophy, psychology, political economy, and philosophy of history, would certainly have to be excluded, while in the ordinary branches of science there would be breaks wide enough to destroy continuity of teaching. Men, however, will often submit calmly to having their children taught erroneously in physics or psychology, while they are up in arms if heresies in religion are inculcated. Upon this latter subject there is extraordinary bitterness. What ought to be done under such circumstances?

First, with regard to schools supported by public moneys. Every one is taxed in this respect on equal principles of property-holding, not in proportion to the amount of his political, economical, or religious

* "Life in Brazil," by Thomas Ewbank, p. 439.

ideas that is to be propagated through the school system. But it is not in human nature that a man should like to see the state using his money to advance notions of which he disapproves. Particularly is this true of religious ideas. Shall his objection be heeded? Suppose a person be found who thinks it contrary to equity and good conscience that his children be taught the binomial theorem. Shall instruction in algebra, therefore, be stopped at this point? Or, shall the objector be forgiven his tax? Or, shall a school be instituted for his benefit where the obnoxious formula is left out? Will not the same argument, whatever it be, hold good for both religion and algebra alike?

The great purpose of education within the domain of the state is, I conceive, to make men of their own wills do what is right; that is, to act for the welfare of the whole organism. They will not so act unless they have the right disposition. Hence good character must be formed to insure good conduct. I do not suppose it will be seriously disputed that to accomplish this end, as regards knowledge, truth only should be taught. A character based on untruth or error is not desired by anybody. The controversy always is over the answer to the query of Pontius Pilate. As a discerning judge in one of the law reports remarks in an opinion: "There is no doubt that the plaintiff in this case ought by his contract to have beans: the question is, What *is* beans?" There is, perhaps, room for doubt whether *all* truth ought to be taught, even admitting it to be truth; but I shall assume that no one will urge that falsehood should be the basis of instruction to youth.

Theoretical knowledge may or may not have direct, appreciable effects upon character and conduct. A good deal of this sort of knowledge, when acquired in school education, is disciplinary for the purpose of exercising and training mental powers. Such is the case, for example, with the binomial theorem just instanced. Perhaps no great harm would result to anybody if it were left out of mathematical instruction in public institutions. But some disciplinary instruction there must be, and some one must decide what it shall be. Men are taxed for the support of schools on the theory that it is for the interest of the state that children be educated. Each one must leave to constituted authorities the power to prescribe in what this education shall consist; and even if he has views of his own, he can not be allowed to make their rejection by the school board just ground for refusing to pay his taxes. For similar reasons he can not ask to have a school established for his own ideas or for his own benefit. Besides, this last would be wholly impracticable on an extended scale. It would destroy the public-school system altogether. Nevertheless, nothing that is here said should prevent any one from agitating matters of complaint as to courses of instruction and enforcing his opinions if he can make them appear reasonable, through the regular channels of influence and authority.

Thus there must be a common order with regard to school instruction, overruling the preferences of individuals until changed by the common will regularly expressed. The question always paramount and fundamental is, then, What does the common interest demand? According to the tenor of our preceding remarks we might answer, Theoretical and practical truth. It would be commonplace to say that youth should be taught not to commit crimes or private wrongs. And further, in accordance with the principle of organic growth, they should be informed, clothed on, if possible, with the altruistic character. In the direct relations of man to man there is comparatively little dispute over what is theoretically right and what is wrong. As to the elementary virtues and vices there is no serious difference of opinion, unless concerning sex-relations, which need not be discussed here. So also as regards elementary knowledge in general. The multiplication-table is well settled, and is universally conceded to be of considerable practical utility. The right use of language might occasion more controversy, but there are standards which are tolerably decisive of disputes. The geography of the globe, the common features in natural history, the principles of mechanics, the ascertained truths of physics generally, can be and are taught without arousing animosity, although points of doubt, of imperfect knowledge, of opposition between authorities, are discovered. In these and like studies it is expected by all intelligent people, of whatever sect or party, that wherever there is question the doubt itself with the arguments for one side or the other will be stated. This is the course usually adopted. The best text-books follow this method. In no other manner can truth be taught. But in this way the learner can be put in possession of the exact state of knowledge in a given branch of study, or upon a certain topic; and if he have the requisite mental capacity, he is placed in the best possible situation also to add to that knowledge. This is obviously for the public interest. The things that are settled, indeed, should be so taught; but when there is dispute the utmost care should be taken to state impartially and accurately the divergent views.

Now, when we come to those departments of knowledge which involve important personal and social questions of practical consequence, respecting which there is contrariety of opinion, we have three courses open. The first is for the public authority to select one set of principles and precepts to the exclusion of others, and command these to be taught as truth, and these only; the second is to refrain from teaching anything whatever on the subject; the third, to adopt the method just mentioned, namely, to present to the learner the different opinions, with the grounds of each, in the most impartial and judicial manner.

If the first plan be adopted, the risk must be run of the doctrines selected not being true. Experience has shown that truth will out; and when once error is discovered, there comes both a demonstration

of the insecurity of the method and a hearty contempt for it. The one who has suffered by the teaching feels himself defrauded and swindled. Unless we can reason ourselves into the belief that falsehood or error is sometimes useful, we shall have to seek some better procedure. And even if we could persuade ourselves of the utility of untruth, we should still have the very perplexing questions to answer as to when, where, and what sort of falsehoods are useful.

But this is not the end of the trouble. If there be difference of opinion, the parties whose doctrines are rejected will inevitably oppose, by every lawful means at least, the principles adopted by those in power. They will nullify school-teaching by home-teaching; they will seek to disturb the school system by overthrowing its government; they will encourage disrespect toward the whole scheme of instruction; they will be in a state of chronic rebellion, which will create a present and pervasive social disorganization outweighing any advantage to be derived from the authoritative teaching. For, even if the latter be the truth, and the other error, the chances are that the force of authority will develop so great a resistance as to give a formidable strength and vitality to the erroneous doctrine; whereas, if its power were not thus artificially gathered and its life thus supported, it would die out from its inherent insufficiency.

Nor yet is this the whole of the matter. The adoption of any assumed truths by authority in the face of a manifest difference of opinion is an oppression which leads directly to anarchy and revolution, with despotism to follow. In order to maintain the teaching, the pressure in support must continually be increased to overbalance the opposition, which nevertheless grows in this very process, until by-and-by an upheaval is inevitable, perhaps with ruinous devastation. This is a familiar historical experience of which I need not stop to give illustration. I desire only to recall attention to the fact that, in the social and political as well as in the physical world, every action has its reaction. Revolution and anarchy are the natural and inevitable consequences of the establishment of truth by command. It may not come immediately, but disintegration is all the while going on, and the results will sooner or later appear. Thus, taking all these considerations, and even omitting the more special arguments which flow from legal guarantees of individual rights as established in a free community, we may be sure that, upon broad principles of the common weal, the first of the three courses suggested for public schools, in regard to education upon disputed questions of practical moment to the individual and to society, must unfailingly be most pernicious.

The second plan, that of teaching nothing at all, is not for the highest public interest, because its effect is to prevent the young from giving attention to, and acquiring accurate knowledge upon, subjects which ultimately will be forced upon them, and will call for opinion or action. Substantially the same reasons prevail against this course

which exist against a negative attitude of the state with regard to education generally. There are thinkers of eminence who believe that the state never should undertake to educate the young, leaving that work wholly to private agencies. Their position, I think, is an unsound one, because education is a necessity for security, and thus a legitimate matter of governmental cognizance. At all events, we have public systems, and, having them, it seems important that some instruction be given upon those topics which evidently take precedence of others in the minds of the people, and are of enough consequence to develop actively an opposition of opinion.

If this be so, there is only the third suggestion left, namely, to extend universally the scientific method of teaching. State the question fairly, give the facts bearing upon it accurately, explain impartially the differences of views with the reasons favoring each; then let the individual form his own conclusions, entirely free from any of the arts of persuasion. This is the only method which subserves the public good, the welfare of the whole organism instead of the interest of a party, and which does not work injustice. Then the tax-payer can not complain; or, if he does, it will clearly be because he is more desirous of serving his own particular idols, whether of personal creation or of party affiliation, than of promoting the cause of truth, in which alone lies the well-being of the community as a whole. The school which educates after this fashion is a powerful help to the stability of the commonwealth; the teacher who thus teaches is a faithful and valuable public servant, for whose support no tax should be paid grudgingly.

While these remarks apply to the whole curriculum of instruction, the practical difficulty of giving such truly scientific instruction is often very great. There is little fairness between contestants; and most people, even teachers, are partisans. Each seeks only to become the oppressor. Ascendency, conquest, domination, is dearer than truth. When this situation occurs, deplorable though it be, there is no alternative but to exclude rigidly all instruction upon the topic which is the subject of such anti-social striving. The first of our three propositions is intolerable; the third and best may be impracticable; then we must resort to the second, in the hope that better conditions may arise. As between the first two, in adopting the second, we are certainly choosing the minor evil.

This I conceive to be the wise practice to follow respecting public instruction, as based on that theory of society which holds that each individual is united in organic association with every other, being at once the means and end of all the rest. Now, with regard to religion, we are to-day in the position where we are obliged to consider seriously whether religious instruction shall be excluded wholly from public institutions, or be given scientifically and impartially. We can make no exception here to the rule that anything actively disputed by any considerable number of individuals in the community shall not be

taught with authority in public institutions. There is not a single doctrine of Christian theology (save, perhaps, the altruistic law of self-abnegation as a rule of conduct) that is not doubted or controverted either within or without the aggregated Church. To begin with, there are two great irreconcilable bodies, the Catholic and the Protestant. Then there are the so-called atheists, the agnostics, the freethinkers. Again, there are multitudes of sects calling themselves Christian, but with differences upon expressions of supposed truth which they often regard as essential. Such being the case, for the sake of religious truth itself it would be unwise to have authoritative instruction given. In addition, there are all the reasons above cited, which militate so strongly against selecting a creed authoritatively out of the many that are put forward. Moreover, in communities like the American commonwealths, there are special reasons against such an adoption. It can not be done without contravening the organic law. Constitutional guarantees of religious freedom are in force in most of the States. For instance, the Constitution of the State of New York provides that "the free exercise and enjoyment of religious profession and worship, without discrimination or preference, shall forever be allowed in this State to all mankind." Mr. R. C. Spencer, one of the Visiting Board of the Wisconsin State Normal School, in an address before the school criticising the religious ceremonies he witnessed (1886), thus expresses the Wisconsin law: "Under the provisions of the Constitution of the State, this school can have no religious purposes. The State has no religious duties to perform; therefore this institution has none. Teachers of public schools and in public institutions have as such no religious duties. On the contrary, the moment the teacher in his capacity as such begins to exercise any religious function whatever, to exert any religious influence upon the minds of those under his instruction, that moment he infringes the reserved rights of the people." Not to multiply examples, under such fundamental law as this, the teaching in public institutions of any religious doctrines as conclusive truth in the face of dissent, is such a misapplication of the powers of government as to demand the most emphatic reprobation.

Must we, then, altogether dismiss religious instruction from public schools? Certainly no complete knowledge of the progress of human civilization can be obtained without including the influences of religion and religious institutions. It is really indispensable knowledge; and, if not gained in schools, must be secured elsewhere. It also involves questions of the gravest practical concern. Perhaps this kind of instruction belongs to higher institutions than those the state undertakes to maintain; though in a normal school, for the education of teachers, it is most directly pertinent. And generally in public schools of higher grade, those high enough, for example, to teach history, it would clearly be an advantage if some account of the leading religious ideas and the chief religious movements in the world's history were made the sub-

ject of instruction. The chief creeds of religion might even be taught, if the objections to them were given equal prominence with the points in their favor. I can not help thinking that a comparative study of articles of faith would be useful. Since, however, most of the religious sects would prefer nothing at all to be said unless their own system be inculcated as infallible, it appears that we must for the present keep out of courses of study all religious teaching. It is a pity that sectarian bitterness makes this necessary. If those who belong to religious parties would only allow consideration to those who differ from them; if they would cease to claim for themselves a monopoly of wisdom and divine favor, there would be no need of this exclusion. But if they insist that their creed be taught, and no other; if they refuse equality of representation of religious ideas; if they are determined that the deficiencies of their own notions be blinked while the defects of others are magnified: then, indeed, the sole course left is, to do the simple justice of absolutely excluding religious instruction.

The extreme difficulty of adopting the other course is evidenced by the strenuous insistance upon the one thing in connection with religion in schools which is most indefensible of all. I refer to worship. This amounts to inculcation of religious doctrine by insinuation. It is the jesuitical method, very potent indeed, but highly objectionable, because, without giving direct teaching, it operates to subtly instill religious creeds. It is neither open nor fair. Worship is something which belongs either to individual choice or to consentience. Those who agree in thought may unite in worship upon the basis of their agreement; otherwise it should be a personal matter. A form of worship implies the truth of the creed which it expresses or upon which it is based. What more dishonest and unworthy method of pre-empting and prejudicing the plastic minds of the young could possibly be devised than that of school worship? The solemnity of the exercise is impressed, all question and criticism are foreclosed, and then, under the sentiment of awe and respect for authority thus fully developed, beliefs are argued into the minds of children by prayer and collateral exercises.

So long as public-school worship is upheld, and the consciences of people are callous to its impropriety, it probably would be vain to expect the critical method of teaching to prevail. And yet in the present state of civilization it may not be a great while before it becomes feasible. A recent writer has asked, "Is there any reason why we should teach the life of Julius Cæsar in our schools and should not teach the life of Jesus Christ?"* I reply, there *ought* to be no reason, indeed, but there *is* one, which springs from the unreasonableness of those who urge religious teaching. That reason lies in the demand that the life of Jesus Christ be taught as the life in the flesh of a divine being, belief in whom is the sole salvation from eternal perdition. Granted,

* "Should the State teach Religion?" J. H. Seelye, "The Forum," July, 1886.

if you please, that this is true; it must also be admitted, deplored if you like, that a great many tax-payers do not believe its truth at all. But those who are represented by the writer quoted never would be willing to have the life of Jesus taught in the same manner as the life of Cæsar. They would not favor, for example, a fair setting forth of the arguments for and those against the miracles recorded in the gospels. They would be utterly horrified at any criticism of the character of Jesus. They would not allow him to be compared with Sakya-muni, as Cæsar might be compared with Alexander. The spirit in which they ask to have the life of Christ taught is that expressed by President Seelye in another part of the same article: "Why, then, on any consideration are not the gospels as proper a text-book in our schools as are Cæsar's 'Commentaries'? And if the teacher of the latter is to know them; if we make thorough inquiry respecting a teacher's qualifications for his task in other things, why not also here? If he does not, in the light of modern criticism, know that the story of the gospels is in the main true, he is ignorant; or if knowing its truth he would hide it, he is false; and in either case not fit to teach." There is an ambiguity in the expression "in the main true," which allows of wide differences. But no doubt the writer would intend to make his statement cover the miraculous events recorded in the gospels, certainly the story of the resurrection of Jesus. Now, upon this point it is to be feared that the ignorance lies on the side of the author cited. He says the historical accuracy of the gospels is "no longer doubted by intelligent persons." Who, having a tolerably large acquaintance of "intelligent persons," does not know that a considerable fraction of them disbelieve and a still larger fraction doubt the statements in the gospel record respecting the resurrection of Jesus? This is evidenced by journals, reviews, and even by religious organizations. If, now, a person who does not believe this account is not "intelligent" but is "ignorant" or "false" and "not fit to teach"; those who are fitted to teach the life of Jesus in the schools are only the ones who accept a particular "orthodox" view of Bible literature and are blind enough to be prevented from seeing intelligent difference of opinion! It is not the life of Jesus that a religious sect wants taught, but a particular theory of the life of Jesus. The Roman Catholics would like to have inculcated a similar theory of the Virgin Mary. How, under such circumstances, is it possible to teach the life of Jesus in the public schools? Until an agreement can be reached upon the platform of a thoroughly fair, critical instruction in religion, giving to believers and disbelievers alike the benefit of their views in equal degree, there is no other course open in a country of religious liberty than to interdict religious teaching in public institutions of learning.

Unless, indeed, we return to the rule of force. Listen to what President Seelye says, in concluding the article above quoted from: "Hence I say that the state should provide for instruction in the

gospels for its own preservation. If the conscience of its subjects approve, well; if not, the state will be cautious, but courageous also, and if it is wise it will not falter." It is difficult to believe that in these days of enlightenment any "intelligent person" can deliberately give utterance to a sentiment like this, which is only appropriate to the times of Cotton and Increase Mather. Can one fail on reading such records to have rise up in his mind the vision of the wicked and bloody Past; the weary centuries of injustice, inhumanity, and woe; the ceaseless succession of robberies, tortures, and murders "for Christ's sake"? Can it be that in this fair American land, "sweet land of liberty," "intelligent persons" are still found who do not see the absolute necessity, for the common freedom, that the state in its governmental office keep wholly aloof from any attempt to inculcate religion or religious doctrine by or with authority?

A plausible suggestion is often made to the effect that the public moneys should be divided among different sects according to their numbers, and used to promote sectarian teaching. This is said to be fair to the tax-payer, and satisfies the desire of those who wish religious teaching according to their own views. But such a plan does not fulfill the idea of state education. Aside from any difficulties as to division of moneys, which might perhaps be overcome, such a scheme would tend to prevent that very growth into organic unity which it is the object to secure. It makes for separatism, prepares the way for consolidation of each sect, and a struggle for supremacy between them. It is the interest of the state not to foster sectarianism, but to eliminate it or keep it strictly subordinate to the common freedom. The young must be brought up to the understanding that their prime allegiance is to the state, the community as a whole, not to any denomination, church, or party. When this is accomplished, private religious belief can be allowed to form itself as it may. But to divide public moneys in the way proposed is really to make the state the promoter of a sect, and to afford opportunity for the use of the public funds for the development of a character quite inconsistent with the public interests. Better have no state system of education at all, if we can not have one entirely free from sectarian control. It does not remove the difficulty that all sects are supposably to be treated equally. Organic development is what is wanted, not the separate nourishment of the different members independently. The public school ought to be a common well of pure water from which all may draw alike and unhindered; and it should be kept free from anything that taints or colors it so that it may not be partaken of by all.

Protestants generally would indorse the foregoing sentiments with regard to the division of public moneys among sects; but, strangely enough, they do not appear to see that their own claims give to the Roman Catholics the strongest case for their demands. The former are determined that the Bible shall be read in schools, with other exer-

cises of worship, and that Protestant religious influences shall positively prevail. Such being their attitude, they can not consistently object to a division of the public moneys. They want sectarian teaching, but that of their own sect. This is what the Roman Catholics ask also. If these claims are strongly insisted upon, it seems that to divide the funds is not only just but the only thing that can be done in a free country, unless taxation for educational purposes be abandoned altogether. If Protestants desire the public-school system continued, they will be careful how they press the theory that the schools must be religious or under religious influences. On the ground which they ordinarily take, they have not the slightest right to oppose the division asked for by the Romanists. The only position from which these latter can be successfully resisted (I mean logically) is the platform of non-religious, or scientific teaching which has been above set forth.

[*To be continued.*]

THE HOUND OF THE PLAINS.

By ERNEST INGERSOLL.

A PICTURE of the Great Plains is incomplete without a coyote or two, hurrying furtively through the distance.

The coyote is a wolf—a wolf about two thirds the size of that one which haunts forests and the pages of story-books. He has a long, lean body; legs a trifle short, but sinewy and active; a head more foxy than wolfish, for the nose is long and pointed; the yellow eyes are set in spectacle-frames of black eyelids, and the hanging, tan-trimmed ears, may be erected, giving a well-merited air of alertness to their wearer; a tail—straight as a pointer's—also fox-like, for it is bushy beyond the ordinary lupine type, and a shaggy, large-maned, wind-ruffled, dust-gathering coat of dingy white, suffused with tawny brown, or often decidedly brindled:

> "A shade in the stubble, a ghost by the wall,
> Now leaping, now limping, now risking a fall;
> Top-eared and large-jointed, but ever alway
> A thoroughly vagabond outcast in gray."

Such is the coyote—*genus loci* of the plains; an Ishmaelite of the desert; a consort of rattlesnake and vulture; the tyrant of his inferiors; jackal to the puma; a bushwhacker upon the flanks of the buffalo armies; the pariah of his own race, and despised by mankind. Withal, he maintains himself and his tribe increases; he outstrips animals fleeter than himself; he foils those of far greater strength; he excels all his rivals in cunning and intelligence; he furnishes to the Indian not only a breed of domestic dogs, but in many canine races

ranks as earliest progenitor; he becomes the center of myths, and finally is apotheosized.

Our coyote is a true Westerner, and typifies the independence, the unrestrained gayety and brisk zeal which enter into the heart of him who sights the Rocky Mountains. He is little known at present eastward of real bunch-grass plains. In early days, however, he was common enough in the open country of Arkansas, Missouri, Illinois, and northward, whence he received the name "prairie-wolf." Threading the passes, he wanders among the foot-hills of all the complicated mountain system that forms the "crest of the continent," and dwells plentifully in California valleys.

In the United States and British America, then, he is a creature of the open country, leaving high mountains and forests to the large, gray "mountain" or "timber" wolf (*Canis lupus*). Perhaps this is less his choice than his necessity, for in Mexico and Central America he seeks his food more often in forests than elsewhere, yet keeps his characteristic cunning and cowardice, becoming there a wild dog of the jungles, as, in the north, he is the hound of the plains. It is that tropical region, in fact, which gives us his name, for coyote is a pure Nahuatl word, with the final *e* softened into an *eh*. This ultimate must not be lost sight of in the pronunciation, which is coy-ó-té, not ki-yōt (or even kyoodle!), as often heard. Dr. D. G. Brinton writes me that the derivation seems to be from the root *coy*, which means a hole, and alludes to the earth-burrowing habits of the animal. I have met with a word of very similar sound, in a Californian language, said to mean "hill-dog."

When this wolf can not find a natural hollow to suit him, nor evict some unhappy hare, prairie-dog, or badger, he digs for himself a dry burrow, or perhaps a den among loose rocks. The *butte* districts of the upper Missouri and the lower Colorado valleys are, therefore, his strongholds. There the decay of sandstone strata, or the breakage due to volcanic eruptions and upheavals, give him the choice of a large number of crannies, while the desolation and remoteness of wide tracts, untenanted by men, afford him the seclusion he loves.

In such seclusion his young family of five to eight pups is brought forth during the latter part of spring, the date ranging earlier or later with the latitude, and the consequently varying advance of warm weather. It is during the weeks going just before and following immediately after the birth of the puppies that the old dog-coyotes work their hardest and most systematically. In hunting at this time, our wolf adds to his ordinary pertinacity and zeal, the sagacity and endurance necessary to turn his victims and drive them back as near as possible to his home, knowing that otherwise his mate and her weaklings will be unable to partake of the feast.

A remarkable picture of this was given some years ago, by a writer in an English magazine, who, in one of the best "animal chapters" it

has ever been my fortune to read, detailed such a chase as witnessed by him in the grand forests near Lake Nicaragua. "Certainly," he exclaims at the conclusion of his account, "certainly no training could have bettered that dog's run. To drive a grown buck back to his starting-place, to send on a portion of the pack to that point where he would strive to break cover, to head him again and again into the cover where his speed could not be exerted to the full, were feats which might well puzzle all the best dogs in England, and the human intelligence which directs them."

His game and its getting are not always so noble as this, however, and the coyote knows well the pinch of famine, especially in winter. "The main object of his life seems to be the satisfying of a hunger which is always craving; and to this aim all his cunning, impudence, and audacity are mainly directed." Nothing comes amiss. Though by no means the swiftest-footed quadruped upon the plains, he runs down the deer, the pronghorn, and others, tiring them out by trickery and then overpowering them by force of numbers. The buffalo formerly afforded him an unfailing supply, in the shape of carrion or chance fragments left him by his Brahmans—the white wolves—who steadily followed the herds, and seized upon decrepit or aged stragglers, or upon any calves they were able to surround and pull down. In such piracy the coyotes themselves often engaged, though it tried their highest powers; and success followed a system of tireless worrying. The poor bison or elk, upon which they concentrated, might trample and gore half the pack, but the rest would "stay by him," and finally nag him to death. I remember once reading an account of the strategy by which a large stag was forced to succumb to a pack that had driven it upon the ice of a frozen lake. Part of the wolves formed a circle about the pond, within which the exhausted and slipping deer was chased round and round, by patrols frequently relieved, until, fainting with fatigue and loss of blood, the noble animal fell, to be torn to pieces in an instant.

Far less worthy game attracts this wild dog as well. In California and Mexico he has been so destructive to the sheep that incessant war is waged upon him by the ranchmen. In Kansas and Nebraska he is accused of making havoc among domestic poultry, suffering, no doubt, the discredit of many additional depredations by foxes, skunks, and weasels. Similar misdeeds were charged against him by the farmers of Illinois and Wisconsin, when, forty years ago, those prairies were the frontier. Two or three times a year, therefore, a general holiday would be declared, and a wolf-hunt would be organized.

Such a *battue* would take place just before the spring thawing. Word would be sent out, instructing the different villages concerned to elect their captains and furnish their quota of willing gunners in the ring that was to concentrate upon a point indicated by a tall flagstaff far out in the prairie. These rings were, sometimes, twenty or

thirty miles in diameter, and it took an early start and rapid traveling to close up in time. The captains, on horseback, ride back and forth, keeping the line in order, watchful that everything is driven before it. After marching for a few miles, the different parties begin to come in sight of one another, all converging toward the central point. Glimpses of fleeing game, very likely including deer, or a wolf or two, are seen, and the orders "Hurry up! hurry up!" are more frequently heard. Finally the flag can be seen, and a little later the line of the opposite side of the circle comes into view. Now all nerves are strung to the highest pitch. There is a constant fusillade of shots as the thickening grouse soar up and backward over the line, or foxes and hares scud away from the shouting and yelling gunners. The captains, suddenly riding at top-speed to one side, shout: "Close up! close up! The deer will break!" Before it can be well done, a small band, following their leader like sheep, dart toward a vacant space in the rank of men. Half the deer get away in safety, but a few fall under the ready rifles, and one, stabbed by a bayonet, carries it and the gun twenty rods before dropping dead.

Soon word is passed to stop firing, for the circle is becoming dangerously contracted. Already one man has a bullet in his leg, and a captain's horse has been shot under him. Thus, in silence, the ring concentrates toward the flag-staff, which stands on the edge of a bowl-like depression. As the rim is attained, what a sight greets the eyes of the eager circle! With lolling tongues and staring eyes, a dozen tawny wolves are rushing up and down the shallow pit, seeking some chance of escape. But no mercy exists for the sneaking lamb-stealers. "Give it to them!" comes the order, and a hundred rifles pour instant death among the corraled victims. Then follow target-matches, trials of strength, races, and plentiful gingerbread, apple-turnovers, cider, and metheglin.

Tactics similar to those of coursing a stag on the ice, already mentioned, are furnished by the coyote when he fixes his heart upon a jack-rabbit. Alone, he could neither overtake nor surprise this vigilant and fleet-footed hare. Two wolves assist one another, therefore, one giving instant chase when a hare is started, while the other squats on his haunches. The runner turns the hare in a circle that brings it back near to the point of starting, where the second wolf is ready to keep it going, while the first rests. A few rounds use up the panting bunny. Then the wolf in chase bowls him over, and seeks to appropriate the whole of his not over-big carcass before the resting partner can claim his share, whereupon a row is very likely to result.

To capture the sage-hen and grouse, the coyote roughly quarters the ground, somewhat like a trained bird-dog, but with frequent crouching pauses, all the time wending his way toward the quarry. At the right moment he will drop flat in the grass and creep stealthily forward, as a cat would do, until near enough to make a fatal spring.

In fact, nothing eatable escapes this omnivorous prowler. It is the arch-enemy of such small deer as prairie-dogs and gophers, as well as of larger mammals; and, if no better food offers, it will revel in carrion of any sort. "It resorts in great numbers to the vicinity of settlements where offal is sure to be found, and surrounds the hunter's camp at night. It is well known to follow for days in the trail of a traveler's party, and each morning, just after camp is broken, it rushes in to claim whatever eatable refuse may have been left behind. But it can not always find a sufficiency of animal food. Particularly in the fall, it feeds extensively upon *tunas* which are the juicy, soft, scarlet fruit of various species of prickly pear (*Opuntia*); and in the winter, upon berries of various sorts, particularly those of the juniper."

Under the pangs of excessive hunger these small wolves are compelled to a furtive boldness they are incapable of under ordinary circumstances. Thus I have known them to come repeatedly within pistol-range of my camp-fire, in the mountains of Southern Colorado, and hunters tell me that they have been known to pull the boots or the leathern straps of a saddle from under the head of a sleeping camper. Sitgreaves records that when, for two days and nights, his party had kept possession of some solitary springs, in an arid part of Arizona, the coyotes became so desperate from thirst that they came to drink while men and mules were at the spring. As a rule, however, they are cowardly to the last degree, and trust to superior numbers and well-laid plans to effect their object. I remember at a place where I once encamped for two or three nights, in Southwestern Wyoming, that the rough ledge of a butte-face, just across the creek, was the home of a family of these wolves, and I often saw them, the mother lying at the mouth of their den, and the four whelps gleefully romping in the sunshine. The father of this family kept out of view at first, but later I caught sight of him in pursuit of a doe-antelope and her fawn. The doe was backing away on the plain, keeping the little one, which seemed to understand its part perfectly, close to her hind-legs. Following her closely ran the wolf, often making a dash to the right or left to get at the fawn; but each time the brave little mother, whirling alertly, would present to him her lowered head, and make a dash at his skull with her sharp fore-hoofs. Thus she retired, but I fancy the pursuer's longer breath and varied tactics won the day at last.

The fact that in his hunting he frequently becomes a rival, his incorrigible thieveries, and his unmanly deportment in hanging about like a conscious felon, cause him to be despised by both hunter and ranchman, who take every means to kill him, save by the honorable use of gunpowder. Yet there are times when he makes himself respected and feared.

A prime characteristic of the coyote is his astonishing voice, which differs so much from the well-known wolfish howl of other members

of his race as to give him the book-name *Canis latrans*, or "barking" wolf. I can not picture this rattling concert (to which I have often been an unwilling listener) of quickly repeated, infinitely varied, ventriloquial yelps better than it has already been done by Dr. Elliott Coues, who confesses the difficulty of conveying in adequate words the noisy confusion of these polyglot serenades:

"One must have spent an hour or two vainly trying to sleep," says this brilliant writer and naturalist, "before he is in condition to appreciate the full force of the annoyance. It is a singular fact that the howling of two or three wolves gives an impression that a score are engaged, so many, so long-drawn are the notes, and so uninterruptedly are they continued by one individual after another. A short, sharp bark is sounded, followed by several more in quick succession, this time growing faster and the pitch higher till they run together into a long-drawn, lugubrious howl in the highest possible key. The same strain is taken up again and again by different members of the pack, while from a great distance the deep, melancholy baying of the more wary *lobo* breaks in, till the very leaves of the trees seem quivering to the inharmonious sounds."

In the memory of this astonishing voice of his, it is amusing to read the story told by the Kaibabits Indians, of Northern Arizona, to account for the diversity of languages; for what animal could better figure in such a history than our polyglot wolf? The old men of the Kaibabits will tell you that in the beginning the grandmother, goddess of all, brought up out of the sea a sack which she gave to the *Cin-aú-av* brothers, great wolf-gods. This sack contained the whole of mankind, and the brothers were bidden to carry it from the shores of the sea to the Kaibab plateau, and by no means to open the package on the way lest, as with Pandora's box, untold evils should be turned loose. But, overcome by curiosity, the younger *Cin-aú-av* untied the sack, when the majority of people swarmed out. The elder *Cin-aú-av* hastened to close it again and carry it to the Kaibab plateau, where the people who had remained found a beautiful home. Those who had escaped were scattered and became Navajos, Moquis, Dakotas, white men, all the outside world in short—poor, sorry fragments of humanity, without the original language of the gods.

The nocturnal prowling, secretive disposition, and remarkable craftiness of this animal, together with the annoyance it has the power to inflict, cause it to figure prominently in the myths and religious histories of the native races of the Far West. Some of these stories I propose to recall, and I am sure they will suggest to every reader at least the reynard of European folk-lore, if not any other interesting parallels.

In all the Mexican pantheon the most sublime figure is that of Tezcatlipoca, creator of heaven and earth, sole ruler of the universe, invisible and omniscient. To him, as presiding over darkness and all

mysteries, was dedicated the nocturnal and crafty coyote. Among the central Mexicans the animal was held in so high honor that it had a temple of its own, a congregation of priests devoted to its services, statues carved in stone, and an elaborate tomb at death. Religious significance attached to dogs and wolves in many ways throughout all tropical America, generally through some connection with the moon. On this side of the Mexican line (that is, in the United States) we find the coyote personified in the mythology of the red men as the Creator himself, or as his foremost agent; while here and there it is identified with the sun (which was the visible incarnation of the Creator to the minds of many), or associating with it and representing its demiurgic force.

This was the ancient coyote—the agile-brained and fleet-footed hill-dog of that old mythologic time, and in that wonderful "land of lost gods and godlike men." The wolf of *to-day* is a howling pest, but that wolf's *ancestor*—the first of the line—was divine!

Among the Indians of the Great Basin speaking Shoshonee in any of its many dialects, the belief in animal-gods—a long list of them in varied relations and ranks—as the creators of the world, is at the foundation of religious belief. "By these animal-gods," says Major Powell, "all things were established. The heavenly bodies were created and their ways appointed; and when the powers and phenomena of Nature are personified the personages are beasts, and all human institutions also were established by the ancient animal-gods." In this theism the ancient rattlesnake, *To-go-av*, is the chief of the council, but *Cin-aú-av*, the coyote (or perhaps, there are two brothers of them as happens in so many myths the world over *), comes next in rank, and arranges mundane affairs. In one story the two discuss the matter of food, and decide that it is better that the Uinkareets shall work for a living than that they should be given a self-renewing store of fruits and roots, with honey-dew falling as the snow. In another the elder decided, against the younger brother's wish, that the dead could not return again; whereupon the younger *Cin-aú-av* killed the son of his brother, and long after taunted him with being the first to suffer by this cruel law. "Then the elder knew that the younger had killed his child; . . . and, as his wrath increased, the earth rocked, subterraneous groanings were heard, darkness came on, fierce storms raged, lightnings flashed, thunder reverberated through the heavens, and the younger brother fled in great terror to his father, *Tu-vwots*, for protection."

An almost exact parallel to this story is to be found among the once powerful Nishinam Indians of Central California; but there the two brothers are represented by the coyote and the moon. The moon was good, but the coyote was bad. In making men the moon wished to fashion their souls so that when they died they should return to

* See Brinton's "Hero Myths," and many other authorities in comparative mythology.

earth after two or three days, as he himself does; but the coyote was evil disposed, and declared that when men died the survivors must burn their bodies. The moon was obliged to acquiesce, but before long caused the death of the coyote's son, and insisted upon the application of the law, to the coyote's great disgust. This recalls also a myth of the Bonaks, or Bannacks (of Southern Idaho), who believe themselves to have been developed out of coyotes by the gradual loss of useless members and a slow adaptation to environment. When one of these coyote ancestors died, various animal shapes would spring from the body, many of which took wings and flew away *to the moon*. The old coyotes, fearing the earth might become depopulated, instituted the cremation of corpses.

In the wonderful adventures of the *Sókus Waí-un-ats*, who was first one, then two, in his long contest with Stone Shirt (as told to Major Powell by the Indians who live at the lower end of the Colorado cañons), *Cin-aú-av* appears "extremely proud of his fame as a hunter," but consoles himself by philosophy under the chagrin of a failure. "What matters it," he observes, "who kills the game, when we can all eat it?"—a maxim worthy of a coyote! In that long solar myth told by Utes, how *Ta-vwots*, the little rabbit, went to kill the sun and caused the conflagration of the world, *Cin-aú-av* is the owner of the first field he comes to, and the producer of the ancient corn whose seed descended to plant the fields of to-day; and he is the hero of many another religious story told by Shoshonee and Kalispel firesides. Nor is this true of Flathead, Ute, and Shoshonees alone. The native races of Northern California were superior in all respects to those living in the southern part of the State; and among them legendary lore reached a degree of perfection not common with Western Indians. In most of these fables the coyote plays a conspicuous part, for the forces of Nature, in whose phenomena most of these stories find their natural origin, are portrayed there (as among the Shoshonees) by animal personages. These ancient animal-gods, represented by degenerate descendants, have also duplicate spirits that visit the world, and whose influence can be secured. Thus, when one Karok has killed another, he frequently barks like a coyote, in the belief that thereby he will be endued with so much of that animal's cunning as will enable him to elude punishment. Perhaps the custom of the medicine-women of this nation of squatting beside an ill man and barking at him for hours together, indicates a similar prayer for sagacity in diagnosis.

The deity and creator of the Karok religion was Kareya, who made the fishes, the mammals, and finally The Man. Him he commanded to assemble all the animals, in order to assign to each its rank, by distributing bows and arrows, the longest to the most powerful, and so on down the scale. The beasts and birds came together the night before the distribution, and all went to sleep except the coyote, who

determined to stay awake all night and go forth earliest in the morning to get the longest bow. He took extraordinary pains to keep awake, but overreached himself in an excess of ingenuity, and fell asleep just before dawn. When he opened his eyes only the very shortest bow was left for him. But Kareya, pitying his weakness and disappointment, gave him cunning ten times greater than before, so that he was sharp-witted above all the animals in the wood. In return, the grateful coyote befriended The Man and his children ever afterward, doing many helpful things for them. Similarly among the Nishinam, where his history began as the evil principle, assisting at the creation, the coyote afterward turned friendly, killing two cannibal giants, procuring fire for the tribe, and doing other feats common to solar heroes the world over. He obtained fire on the plan of the monkey and the cat in the matter of roasted chestnuts—by sending after it the lizard, who, with the bat and sand-hill crane that helped him, saw some exciting adventures.

When Kareya made the fishes he did not let the salmon come up the Klamath, in consequence of which the Karok, who live on its upper part, were sorely pressed for food. But Kareya had made a great fish-dam at the mouth of the river, and given the key to two old hags to keep, who never ceased the watching even to sleep. Seeing that the Indians were nearly starved, the coyote befriended them. He made a visit to the hags on an ingenious pretext, but only succeeded so far as to find that the key was kept too high for him to reach it. He stayed all night in the cabin with the hags, pretending to sleep, but watching their movements out of a corner of his eye. In the morning one of the hags took down the key and started to get some salmon for her breakfast. Then the coyote happened to think of a way to get the key. Jumping up he darted under the hag, throwing her down and causing her to fling the key a long way off. Before she could scramble up, the coyote had seized the key and opened the dam. Thus the salmon could ascend the Klamath, and the Karok had plenty of food. But they had no fire to cook it with, because Kareya had hidden it in a casket which he gave to two sleepless hags far toward the rising sun. So the coyote promised to try to get this second boon for them.

He stationed a line of animals all along the road from the home of the Karok to the far-distant land where the fire was, the strongest near the fire, and last of all concealed an Indian under a hill. This done, the coyote insinuated himself politely into the good graces of the old guardians, and lay by their hearth all night feeling very comfortable and pretending to sleep. But he was soon convinced that without help there was no way to elude their vigilance; so in the morning he stole out and had a talk with the Indian under the hill, after which he went back and lay down by the hearth as before. Presently, as had been concerted, the Indian was heard hammering at the door, as if to

break it in, and the old beldames rushed out to drive him away. This was the coyote's opportunity. As the hags dashed out at one door, the cunning thief seized a flaming brand in his teeth and leaped through the other. He almost flew over the ground, but the hags saw the sparks and gave chase, gaining on him fast. By the time he was out of breath he reached the puma, who took the brand and ran with it to the next animal, and so on. Last of all was the frog, who caught the fire in his mouth, swallowed it, and dived, the hags catching his tail (he was a tadpole then) and twitching it off in the act. The frog swam under water a long distance, then came up and spat the fire into a log of drift-wood, and there it has stayed ever since, so that when an Indian rubs two pieces of wood together the fire comes forth. Another cognate myth (Gallinomero) says dry wood was first invested with this perpetual spark after the coyote had rubbed two pieces together until they ignited. The Navajos recount a similar fable. They, too, lacked fire, and were in distress, so the coyote, the bat, and the squirrel promised to get it for them, the fire seeming to be in the possession of the animals in general at a distance. The coyote fastened pine splinters in his tail, went to the place where the article was to be had, dashed through the flames and started homeward at full gallop. When out of breath the bat relieved him and flew till he was ready to drop, when the squirrel caught the torch and carried it into the camp of the Navajos. This recalls the Nishinam fable, though the two tribes belong to different linguistic stocks, and live a thousand miles apart. The Shastikas account for the origin of fire by saying that a long time ago there was a fire-stone in the East, white and glistening like pure crystal, which the coyote brought and gave to the Indians.

After Kareya had made him so amusing, the coyote grew ambitious and tried many feats which Kareya had never intended for him. The Karoks explain meteors, and especially those that seem to burst, by a story of these failures on the part of the adventurous animal who waited on a mountain-top and tried to dance with the stars. The star took him up, but would not stop when the novice grew tired, because Kareya had made it to keep moving. Thus he was compelled to go on dancing and dangling until he fell to pieces. Among the Navajos one hears that after the sun and moon had been made in the heavenly workshop, the "old men" set about embroidering the sky with stars in beautiful patterns; but, just as they had made a beginning, the coyote rushed in and contemptuously scattered the pile of stars broadcast over the floor of heaven, just as they now lie. The Kern River (California) tribes (related to the Pi-Utes) recite a complicated myth of how the coyote once made a trip through the sky in company with the sun. Another Californian race, the Tatus, believe the coyote to have been the original of human kind, and one of their legends accounts for Clear Lake, near which they dwelt. Many hundred snows ago, while men were yet in the form of coyotes, an exceedingly great

drought parched the land, during which a famous coyote and his two sons ate many grasshoppers—all the animal life there was left. The only water was in Clear Lake, and thither they journeyed. The sons died on the way, but the father reached the lake and drank it dry. Then he lay down and fell asleep. As he slept, there came a man from the south and pricked him with a spear, so that the waters flowed forth from him and returned to the lake until it was full again, while the grasshoppers he had eaten became fishes. There are other legends accounting for this deep and beautiful piece of water in which the coyote is made to exercise supreme functions.

In the early days of the earth, as a Gallinomero philosopher will teach you, all Nature was wrapped in darkness, and there was dire confusion and endless collisions, one of which brought the coyote and hawk together. Instead of indulging idle recriminations, they consulted how they could improve this state of things. The coyote groped his way into a swamp and gathered a quantity of dry *tules* which he rolled into a large ball. This he gave to the hawk, with some flints, and sent him up into heaven with it, where he touched it off and sent it whirling round the earth. This was the sun. The moon they made in the same way, only the *tules* happened to be damp and did not burn so well. There is a legend current among the Papagos on the Gila River, Arizona, of a deluge from which only their great myth-hero Montezuma (not to be confounded with the veritable Aztec emperor whom Cortes saw) and the coyote escaped. The coyote had foretold this deluge, and Montezuma had hollowed out a canoe, while the coyote prepared for himself an ark in a hollow cane.

The Ashochimi preserve a legend of a flood which drowned all living creatures except the coyote. Seeking out over all the world the sites of the antediluvian villages, he gathered the floating tail-feathers of hawks, owls, and buzzards, and planted one wherever a wigwam had stood. In due time these feathers sprouted, branched, and finally turned into men and women.

The Pitt-River (California) Indians have a somewhat similar story. Their coyote began the earth by scratching it up out of nothingness. Then the eagle complained that he had no perch, whereupon the coyote scratched up great ridges. When the eagle flew over them his feathers dropped down, took root, and became trees, and the pin-feathers bushes and plants. After men had been created, they were freezing for want of fire, stole some of it, and kindled a fire in the mountains, to which the Indians resorted. The Shastika say that originally the sun had nine brothers flaming hot with fire, so that the world was likely to perish, but the coyote slew them, and saved mankind from burning up. There were ten moons also, all made of ice, so that in the night people nearly froze to death. Nine of these the coyote slew with his flint knife, carrying heated stones to keep his hands warm.

The Miwok possess a very elaborate myth of the creation of man, in

regard to which the coyote called a council of animals after he had finished fashioning the globe and all the inferior creatures. Each speaker wanted to form man just like himself. The coyote made free to say that this was all nonsense; he did not think himself the most perfect animal that could be made, and he announced it as his theory that man should be formed by taking the best points of all the others—strong voice, like a lion; lack of tail, like a bear (since, in his opinion, a tail was only a harbor for fleas); the sharp eye of the elk, and so on. "But," said the autocrat, "there surely is no animal from whom man can borrow *wit* besides myself, and therefore he shall resemble the coyote in being cunning and crafty." Then the council broke up in a row, and there was a general battle, following which every animal set to work to make an earthen image after his own ideas. Night came before any models were finished, and all the sculptors went to sleep except the coyote, who, when the camp became still, destroyed the other models, made the composite one he had proposed, and gave it life at the coming of the dawn.

The quick wits and inquiring mind of the prairie-wolf serve him not only in chasing but in saving himself from being chased. Next to the wolverine he is perhaps the wariest of animals—not excepting the fox—against which the trapper pits himself. To poisoned meat he falls a victim through his exorbitant appetite, and in this way the ranchmen destroy great numbers annually; but he is rarely trapped. Say tells, with a touch of glee, how Titian Peale was baffled in trying to catch a coyote for his famous museum—one of the sights of old Philadelphia.

Peale's first experiment was with a "figure 4," which came to naught because a wolf burrowed under the floor and pulled the bait down between the planks. "This procedure," remarks Mr. Say, "would seem to be the result of a faculty beyond mere instinct." A cage was constructed, into which the wolves might enter, but out of which they could not again escape. The coyotes came, admired this arrangement, sang doleful jeremiads over the bait which they could see and smell, but could not taste, and went away again, wondering at the heart of mankind and the malignant devices thereof.

Disappointed here, Mr. Peale next began a series of experiments with steel traps, one of which, profusely baited, was concealed among the leaves. Plenty of tracks—"you can't live on tracks!" is one of the aphorisms of the plains—alone rewarded this effort. Then a seductive bait was suspended above the trap in the midst of several other pieces, but the expected victims, stepping circumspectly, carried off all the meat except the one piece it was intended they should take. Baits were next hung up as before, the trap was buried in leaves, and these were burned, so that the trap, scorched free from any odor of human handling, lay covered with ashes; still, the one bait over the

steel jaws was avoided, and no sinewy foot was pinched. Finally, a wicked arrangement of innocent-looking logs set on a trigger was made to fall upon the poor wolf and destroy him. Peale got his "specimen," but it was only by brute force; the coyote was a match for him in brain.

The skins of these wolves are not so highly valued as those of the big gray wolf, yet formerly they entered largely into the shipments of the Hudson Bay Company, for whom they were "cased" or stripped off wrong side out, as is done with the smaller animals. At present they are in demand to a small extent for making sleigh-robes, rugs, etc., but can scarcely be counted among the commercial furs.

The striking resemblance between the coyote and the majority of the snappish curs thronging in the camps of the redskins long ago attracted attention, and with good reason, for they are descended from tamed wolves of one kind or another, and the stock is constantly and designedly replenished by their masters through mixture with the wild wolves.

As a pet, the coyote is not in great favor. He will, indeed, stay at home and consent to friendly and even affectionate terms with his owner, but he seems to have not a particle of gratitude, nor any of that responsive attachment which makes the well-bred dog so lovable as a friend. Moreover, in spite of his natural subtlety and shrewdness, he shows little aptitude for learning the ordinary accomplishments of dogs, and so fails to sustain an interest in himself after the novelty of first acquaintance has worn off. He is faithful to his model, and lives up to the motto, "Once a coyote always a coyote."

THE EXPERIMENTAL STUDY OF NATURE.*

By Dr. F. W. PAVY, F.R.S.

THE next part of my duty is to exhort the fellows and members of this college "to search and study out the secrets of Nature by way of experiment." These are the directions I am to follow, and they give me a wide field to select a course of procedure from. The kind of exhortation I shall employ will consist in placing before you a view of the method of work which Harvey himself adopted, and then, as an incentive to follow his example, I will display some of the fruit yielded by recent research conducted upon the lines of his procedure.

The object to be promoted is the acquirement of additional knowledge. It is an old but true saying that knowledge is power. We accept the doctrine, which comes to us in definite shape from no less

* From the "Harvcian Oration," delivered at the Royal College of Physicians, London, October 18, 1886.

ancient an authority than Aristotle, that there is no such thing as innate knowledge—that knowledge of every kind has to be acquired, and that it is based upon perceptions reaching the mind through the senses. Harvey thus epitomizes what was said by Aristotle respecting the manner in which the knowledge appertaining to science is acquired: "The thing perceived by sense remains; from the permanence of the thing perceived results memory; from multiplied memory, experience; and from experience, universal reason, definitions, and maxims or common axioms." In its elementary form, knowledge consists of simple inferences drawn in a direct manner from impressions. A child once burned afterward shuns the fire. From the impression received an inference is framed which forms the foundation for future action. The same kind of operation determines the conduct of the lower animals. By mental action these simple inferences may be raised into or give rise to knowledge of a higher kind. This is what for science is required to be done. The exercise of the intellectual faculties must be brought into operation, in order that what we acquire through perception may be shaped into the knowledge that it is desired to obtain. The object in science is to discover the facts and laws of Nature; and, to apply the intellect advantageously for the purpose, there must be some systematic course, some method or art of reasoning, adopted. The system employed up to Harvey's time was the Aristotelian, or syllogistic—a system which, while being well adapted for affording proof upon any particular point, is ill adapted for promoting the advance of knowledge. When through the major and minor premises of a syllogism I draw a conclusion, a point is proved, but no real addition is made to our stock of knowledge. For instance, when in accordance with the rules of the syllogistic art I say—"All men are mortal: Thomas is a man, therefore Thomas is mortal"—I start with the general proposition in the major premise that "all men are mortal," and arrive at the conclusion, through the minor premise, that a particular individual is mortal. A certain attribute—mortality—is asserted to be possessed by a class. A member of the class must also possess the attribute, and this is all the information that my syllogistic conclusion has given me—that the individual named Thomas possesses the attribute of mortality, which belongs as a general character to the group of individuals of which he is a member. The two premises of the syllogism already consist of established truths, and for a syllogism to be valid there must be nothing contained in the conclusion beyond what is asserted in the premises. The train of reasoning, therefore, is not adapted to lead us to the acquirement of new knowledge. The essence, indeed, of the system consists in proceeding from generals to particulars. The major premise with which we start is, in reality, a general proposition, containing knowledge which has been acquired—not, it is true, by the methodical application of induction, but nevertheless after the manner of

induction—by observation repeated and confirmed until the thing has come to be accepted as an established truth.

Harvey was shrewd enough to perceive that such a system of reasoning, which had continued in use up to the period in which he lived, did not assist in the disclosure of the secrets of Nature. He says: "The method of investigating truth commonly pursued at this time is to be held as erroneous and almost foolish, in which so many inquire what others have *said*, and omit to ask whether the things themselves be actually so or not; and single universal conclusions being deduced from several premises, and analogies being thence shaped out, we have frequently mere verisimilitudes handed down to us instead of positive truths." Men's minds must have evidently now become occupied with the new system of philosophy set forth by Lord Bacon, in his "Novum Organum," or "True Directions Concerning the Interpretation of Nature." One of the aphorisms of this work clearly exhibits the difference between the new system and the old: "There are and can be only two ways of searching into and discovering truth. The one flies from the senses and particulars to the most general axioms, and from these principles, the truth of which it takes for settled and immovable, proceeds to judgment and to the discovery of middle axioms. The other derives axioms from the senses and particulars, rising by a gradual and unbroken ascent, so that it arrives at the most general axioms last of all." Upon system, or plan of procedure, a great deal depends: look at any undertaking carried out under a good system and a bad. The ancients were a long time in learning the right system to adopt, but it was indeed a great day for science when the method of reasoning by induction was introduced. Starting with particulars or facts which are collected from Nature by observation and experiment applied in every available way, it proceeds step by step in the process of generalizing until the largest and widest propositions are obtained. From the proposition which has been formulated out of, it may be, only a few facts, advance is made with the aid of other facts to propositions of a more and more general character. The unknown is brought into the domain of the known, and as this domain increases, not only is the position acquired strengthened, but at the same time rendered more advantageous for the attainment of further extension. Thus the march onward proceeds, and when some general law of Nature—like, for instance, gravitation, the correlation of the physical forces, or, even, with a more limited bearing, reflex spinal action—is discovered, a gain is made which, through reflected influence, has the effect of at once immensely enlarging and perfecting the understanding. Truly, it may be said, the explorer by the inductive method does not know whither he may be led. He dedicates himself

"To unpathed waters—undreamed shores,"

and follows simply the direction indicated to be taken by what happens to be revealed. Guided entirely by the facts disclosed by observa-

tion and experiment, he brings the instrumental agency of the mind as a reasoning power to bear upon them, and draws from them that which adds to the store of knowledge already possessed. He seeks for facts and interprets their meaning as they come before him. This was the course pursued by Harvey. Instead of giving himself up, as others had done before him, to arguing out conclusions from accepted axioms, he struck out into the hitherto untrodden path of inquiry—that of induction—and sought knowledge by a direct appeal to Nature through the medium of observation and experiment. "It were disgraceful," he says, "with this most spacious and admirable realm of Nature before us, did we take the reports of others upon trust, and go on coining crude problems out of these, and on them hanging knotty and captious and petty disputations. Nature is herself to be addressed; the paths she shows us are to be boldly trodden."

In the discovery of the circulation, Harvey applied the principles of induction, and argued upon them in a strictly logical way. He showed himself to be a good and careful observer, judged even by the standard set forth in the following words of John Stuart Mill, on the process of observing. "The observer," says Mill, "is not he who merely sees the thing which is before his eyes, but he who sees what parts that thing is composed of. To do this well is a rare talent. One person, from inattention, or attending only in the wrong place, overlooks half of what he sees. Another sets down much more than he sees, confounding it with what he imagines or with what he infers. Another takes note of the *kind* of all the circumstances, but, being inexpert in estimating their degree, leaves the quantity of each vague and uncertain. Another sees, indeed, the whole, but makes such an awkward division of it into parts, throwing things into one mass which require to be separated, and separating others which might more conveniently be considered as one, that the result is much the same, sometimes even worse, than if no analysis had been attempted at all, It would be possible to point out what qualities of mind and modes of mental culture fit a person for being a good observer; that, however, is a question not of logic, but of the theory of education, in the most enlarged sense of the term."

The experiments which Harvey conducted on the arteries and veins to assist him in his inquiry were founded upon a well-devised plan. It may be said of experiment, that it affords the means of varying the circumstances, and thus aids immensely the acquirement of knowledge by induction. In the application of the faculties to discovery, the mind asks itself what facts are needed to assist in the establishment of a correct conclusion. The fact may be looked for among the varied instances presented by Nature; or, by an artificial arrangement of circumstances, the required instance may be made—in other words, experiment may be had recourse to for supplying what is wanted. In the one case, we get our fact by observation from the variations in the

circumstances spontaneously furnished by Nature; in the other, we obtain it from experiment, which possesses the great advantage over observation not only of furnishing us with a much greater number of variations than is to be found naturally presented, but also of enabling us to produce the precise form of combination or variation which is needed for our purpose.

Harvey, in a true sense, adopted the Baconian system of interrogating Nature by appeal to observation and experiment, and drawing conclusions out of the facts presented, and yet it is evident that the "Novum Organum" was not published till after the discovery of the circulation was made. Bacon's new method of conducting research and discovering the truths of Nature was placed before the public in 1620. Harvey's work on the circulation, "Exercitatio Anatomica de Motu Cordis et Sanguinis Animalibus," was not published till 1628, but it has been generally allowed that his discovery was made known in his first course of Lumleian lectures, delivered at the college in 1616; and, thanks to the meritorious labors of a committee of the college, this has now been rendered open to verification by the very interesting volume just prepared, and on the point of being issued, containing a reproduction in autotype form of his original lecture-notes in his own handwriting. Harvey, then, must have been thoroughly in the van of progress taking place in his day; and, further, the contemporaries of Bacon must have been acquainted with the new system of philosophy before the "Novum Organum" was published.

Harvey's discovery established a new departure in physiology. Without a knowledge of the circulation, nothing really could be known about the various operations taking place within us. It is hard, with the knowledge now possessed, to realize the state existing at the time the circulation was discovered. The passage of blood from the right to the left side of the heart had, it is true, already been recognized, but it was taught that the blood went to the lungs for their nutrition, and "to be elaborated and subtilized by the reception of a spirit from the air in inspiration, and the exhalation of a fuliginous matter in expiration." The heart and arteries were supposed to be the seat of the vital spirit, and the liver to be the fountain whence the body was supplied with blood through the veins, in which there was believed to be a to-and-fro current, a flux and reflux, that was compared to the ebb and flow of the tide in the classic straits of Euripus. Truly, indeed, may it be asserted, that our ancestors stand in the twofold position of our parents with respect to age, our children with respect to knowledge.

It was not without opposition that Harvey's views were received; and the high position in his profession he had attained did not suffice to prevent his escape from the effect of the prejudice against innovation entertained by the multitude. Aubrey tells us he had "heard him say that after his book on the circulation of the blood came out,

he fell mightily in his practice; 'twas believed by the vulgar that he was crack-brained, and all the physicians were against him." Harvey lived, however, to see his doctrine generally accepted. But such are the vicissitudes of time, that in our day an attempt has been made to deprive him of the title of discoverer of the circulation, and give it to an Italian physician, Cesalpino, because it has been found that a few words of what he wrote can be construed into suggesting that a conception of the circulation existed in his mind. Most ably and successfully have my predecessors in the delivery of this oration, Sir Edward Sieveking and Dr. George Johnson, combated the claim that has been put forward on behalf of Cesalpino, and maintained the position of Harvey.

Science prepares the ground for the exercise of art. The one—science—is concerned with knowledge as knowledge; the other, with the application of it to a practical end. Our art—our *raison d'être* as members of the medical profession—is to apply the knowledge of medical science to the prevention of, cure or mitigation of, and alleviation of the sufferings from disease—to secure, in fact, for man as natural a passage through life as happens to be attainable. We can not prevent death. Lord Bacon, in his essay "De Morte," said:

"Æque enim est naturale hominibus mori, ac nasci."

True, it is as natural to die as to be born; and Nature's laws must be complied with. Our aim is to avert premature death. A certain power, given to us at starting upon our existence, carries us on, under exposure to the proper conditions or influences for keeping this power going. But, in the exercise of its action, although for a while it shows no signs of a failing tendency, yet assuredly it progresses toward exhaustion and ultimate extinction. Accompanying, and doubtless dependent on, the declining power, and assisting in leading to its becoming extinguished, there is an advancing deterioration of the material organism in which the power is manifested. Such is what is natural; but many circumstances contribute to avert the natural, the ordinary course being run. The power given to start with may not be equal to the standard, and the issue of generation may, in consequence, present itself under a weak and ill-developed form, easily falling a victim to influences that there ought to be strength enough to resist. There may be a taint in the power derived by generation from the parents—something transmitted by inheritance, which may give rise to a tendency to the development of some structural deviation from the natural state, or to the performance of one or other functional operation of life, in a manner that does not conform with what may be said to be strictly natural. It is a law of Nature for the offspring, more or less closely, to assume the likeness of the parent, and likeness in the shape of what is wrong may be assumed as well as in the shape of what is right.

Quitting the quality of the power given to us to start with, we are next dependent upon the influences derived from the external or surrounding conditions to which we become exposed. Light, air, what we eat and drink, or what in any way gets into the system, temperature, exercise of mind and body—in short, the conditions under which we live—all exert their influence in favoring or otherwise a natural passage through life. Within us, operations forming a part of the operations of Nature proceed, but these operations are influenced by—owe their activity, indeed, to—the surrounding conditions, and thus it is that upon these surrounding conditions depends whether a natural course is run or not. Under the same law, these surrounding conditions may exert a modifying influence in this or that particular direction upon the operations that are proceeding, and by long continuance in force may lead to the establishment of a more or less modified state as a part of our nature, in accordance with the Darwinian principle of natural selection. This matter—the modifications for good or bad, wrought in our nature by the influence of external conditions—embraces a wide field of study, and comprehends nothing less than the possession of a knowledge of the varied operations, with the laws determining them, going on around us, in order that we may understand the manner in which they are brought about. It is a vast subject, but the mind of man has already done much, and there is reason to think will do much more, toward penetrating it; and, as with the amount of knowledge acquired, power is possessed—that is, the power of arranging conditions or operations so as to render them subservient to the production of a desired effect—man stands in the position of an increasingly powerful agent in the realm of Nature. Must not the mind itself, then, through which this is accomplished, be reckoned as a power—a great power among the powers of the universe? In our special department as medical practitioners, it falls to us to apply the power which knowledge gives us toward preventing unnatural conditions of the body from being allowed to become developed, and toward bringing the unnatural back into the natural state—in fact, toward aiding in carrying life on in a natural manner through its ordinary term of existence.—*Lancet.*

VINEGAR AND ITS MOTHER.

By FREDERIK A. FERNALD.

"SWEET as sugar" and "sour as vinegar" are among the most common comparisons in our language, and the two substances chosen to represent these opposite qualities are popularly deemed as unlike as they can well be. Yet it is one of the marvels of chemistry that the sourest substance with which we are familiar is made from the sweetest. By the action of a ferment, the sugar in some sweet

liquid is turned first to alcohol, and the alcohol then changes to acetic acid, which is the acid in vinegar.

In Great Britain, vinegar, until recently, has been manufactured almost entirely from malt—a wort, or sugary solution, weaker than is employed for beer, being first made. Of late years, glucose, cane-sugar, and molasses, have been largely used. British "proof-vinegar" contains 4·6 per cent of anhydrous acid. A notion formerly prevailed that sulphuric acid acted as a preservative to vinegar, and one tenth of one per cent was allowed to be added. Makers continued the practice after they knew that it had no such effect, as it increased the apparent strength of their vinegar at a slight cost. This addition is now an illegal adulteration.

In France, and elsewhere in Europe, the manufacturer starts with an alcoholic liquid, already partly acetified—light wines that have turned sour being generally employed. The French name, *vinaigre*, from which the English word vinegar is derived, means *sour wine*. Two sorts are produced—white-wine and red-wine vinegar—the former being generally preferred. These are fine-flavored and somewhat stronger than the malt-vinegar of Great Britain. Six and one half to seven per cent of acid have been found in French vinegars. Sour ale and beer do not yield good vinegar.

In the United States, cider vinegar has long held the preference, and, if the cider has been made from sound, sweet apples, the vinegar has a very agreeable flavor and color. The old-fashioned way which is followed by farmers in making vinegar is to set out-of-doors in the spring a barrel of cider which has become too "hard" and sour to drink, from the sugar partly turning to alcohol and acetic acid. The bung is taken out of the barrel, and the bung-hole is loosely stopped by sticking the neck of a large bottle into it. Such exposure to the air at a warm temperature effects the conversion of the cider to vinegar in three or four months. The change goes on very slowly, because the air can act only on the surface of the liquid, and fresh portions of alcohol are brought to the surface only as the newly formed acid sinks and mingles with the liquid below. The best cider-vinegar is made from new cider, and it is well to cause several fermentations to take place by adding a fresh quantity of cider every two weeks.

Vinegar is chemically a dilute solution of acetic acid, containing minute quantities of fragrant ethers, which give it its odor, and some brownish substance, to which is due its color. Other matters, derived from the liquid from which the vinegar is made, are sometimes accidentally present, as sugar, gum, starch, cream of tartar, and other salts, etc. It usually consists of between ninety-three and ninety-seven per cent of water, the rest being acid, except a fraction of a per cent of solids. The transformation of the sugar in fruit juices or sirups to acetic acid takes place according to the following chemical reactions :

$$\underset{\text{Sugar.}}{C_6H_{12}O_6} = \underset{\text{Alcohol.}}{2C_2H_6O} + \underset{\text{Carbonic dioxide.}}{2CO_2}$$

The bubbles which appear when cider is "working" are carbonic dioxide. In the conversion of alcohol to acetic acid, a subtance called aldehyde is first formed. The oxygen for these changes is taken from the air:

$$\underset{\text{Alcohol.}}{C_2H_6O} + \underset{\text{Oxygen.}}{O} = \underset{\text{Aldehyde.}}{C_2H_4O} + \underset{\text{Water.}}{H_2O}.$$

$$C_2H_4O + O = \underset{\text{Acetic acid.}}{C_2H_4O_2}$$

By substantially the same slow process as that still employed in the household was all vinegar obtained from the time of Moses, or earlier, down to 1822. In 1814 Berzelius had found out the chemical composition of acetic acid, and De Saussure that of alcohol; so that, after Doebereiner had discovered that a weak solution of alcohol exposed to the air in contact with platinum-black was converted to acetic acid, he was enabled to set forth the theory on which depends the modern "quick process" of vinegar-making—the method now regularly employed in the vinegar-factories of Europe and America. The essential feature of this process consists in bringing the alcoholic solution into intimate contact with the air by causing it to trickle through a mass of loose material, which effects the acetification in from twenty-four to forty-eight hours. The operation is carried on in wooden tubs, six to ten or more feet high, called generators. Around the sides of the generator, a few inches above the bottom, is a ring of air-holes. Just above the air-holes is a perforated false bottom, and from this nearly to the top the generator is filled with beech-wood shavings, which are closely curled so that they will not crush and prevent the air circulating freely through them. A few inches above the shavings is a wooden head or sieve, perforated with small holes, which serves to distribute the alcoholic liquid, or "wash," evenly over the shavings. Several air-pipes are inserted in the sieve, extending a few inches above and below it. The generator has a cover with a hole in the middle through which the wash is poured in, and the ascending current of air passes out. The vinegar-room is kept at a temperature between 70° and 90° Fahr. A high temperature and large supply of air hasten the operation, but cause loss by the evaporation of the alcohol. If the temperature falls much below 60°, the acetification stops, and putrefaction sets in; while if too little fresh air is supplied, aldehyde, the halfway product mentioned above, instead of being promptly converted to acetic acid, is evaporated and lost. The presence of aldehyde in the air may be detected by its penetrating aroma and by the eyes smarting. The wash must be passed several times through the shavings, in order to effect its complete acetification.

Two kinds of vinegar are sold by grocers in the United States for domestic use—cider-vinegar and white-wine vinegar. Both kinds are

made in factories by the process just described. Massachusetts, New York, and some other Eastern States have laws concerning vinegar. In these States the cider-vinegar may be depended on as being really made from cider, for the risk of heavy penalties is incurred by offering anything else under this name. The laws require, also, that all vinegar shall contain four and a half per cent of acetic acid. Cider-vinegar contains a little malic acid, and will give a precipitate with acetate of lead. The absence of the precipitate shows that the sample is not cider-vinegar; but other vinegar, to which malic acid has been added, will, of course, yield the precipitate. Many persons still retain a strong preference for cider-vinegar, but this, like the old preference for feather-beds, is gradually passing away. As rotten apples, and more or less of other kinds of dirt, commonly go into the cider-mill with the sound fruit, and no thorough purification of the product is attempted, not much can be said for home-made cider-vinegar on the score of purity. Many times as much white-wine as cider vinegar is now consumed in the United States. The white-wine vinegar, however, is not made from white wine, as that beverage is not sufficiently abundant in this country to supply the demand of the vinegar-manufacture. Until recently, manufacturers started with whisky, rum, or other alcoholic liquor, but they are now allowed to produce their own spirits. In the East, molasses, and in the West a wort from grain, is first fermented in a vinegar-still—an apparatus having no worm—and a liquor containing fifteen to twenty per cent of alcohol is produced. The liquor is then converted to vinegar in the usual way. This vinegar is perfectly colorless, and the brownish color which the consumer expects in vinegar is given to it by the addition of some harmless substance, as burned sugar, or an infusion of roasted barley-malt. Cider-vinegar has an agreeable flavor, due to the presence of acetic ether and malic acid. Vinegar from well-flavored wines is the most agreeable, as the ethers which give the bouquet to the wine produce a pleasant flavor in the resulting vinegar. Whisky containing fusel-oil yields a pleasant vinegar, as the fusel-oil during the acetification is decomposed into fragrant ethers. Vinegar is flavored artificially by adding to the last wash oil of cloves, or some fragrant ether.

A recipe is given in Ure's "Dictionary," by which it is said that an excellent vinegar for domestic use can be made. To each gallon of a sirup, containing one and a quarter pound of sugar to a gallon of water, is added one quarter of a pint of good yeast. The liquid is kept at a temperature of from 75° to 80° Fahr. for two or three days, and is then racked off from the sediment into the ripening-cask, where one ounce of cream of tartar and one ounce of crushed raisins for each gallon is mixed in. When the vinegar is freed from any sweet taste, it is drawn off clear into bottles and closely corked.

Vinegar should not be kept in metallic vessels except those of silver or perfectly clean copper. Earthenware glazed with oxide of

lead (litharge) should never be used, but salt-glazed ware is safe. Vinegar is rarely adulterated with sulphuric acid; and oxalic acid, which is a violent poison, has also been found in it. According to the "United States Dispensatory," if vinegar is evaporated in contact with white sugar, or on white paper, the presence of free sulphuric acid will be indicated by charring. Such acrid substances as red pepper and mustard are sometimes added to vinegar to increase its apparent sharpness. They may be detected by their biting taste after evaporating a portion of the vinegar to a small bulk. Consumers need have little fear of adulterations, however, if their vinegar comes from ordinarily reputable dealers; besides, genuine vinegar can be made more cheaply than any passable imitation. There is more chance of unwholesome vinegar coming into the household in pickles and catchups than when the vinegar is bought alone.

By distillation vinegar is deprived of its coloring and other non-volatile matters. The product is always weaker than the vinegar from which it is derived, as the boiling-point of strong acetic acid is above that of water, and it contains small quantities of alcohol and empyreumatic bodies formed during the operation. Distilled vinegar was formerly used in pharmacy, but dilute acetic acid has now taken its place.

The acetic acid used in the arts is not obtained from the acetification of alcoholic liquors, but from the destructive distillation of wood, generally in the form of sawdust. It is called commercially pyroligneous acid, or wood-vinegar, and contains as impurities tar, wood-spirit, etc., which give it an empyreumatic or smoky odor, and which make it superior to other vinegar for preserving meats, pickles, etc. It is purified, and with the addition of coloring and flavoring matters has been sold for culinary use. As the complete purification is an expensive process, there is danger that this vinegar, if sold at a low price, will contain unwholesome substances.

The value of vinegar as a condiment depends on the fact that acetic acid dissolves gelatin, fibrin, and albumen; hence it aids in digesting young meats, fish, lobsters, and hard-boiled eggs. The acid assists also in the conversion of cellulose into sugar, which is the first stage in the digestion of the green leaves used in salads. It is a mistake to use vinegar on beans, for it renders insoluble the legumin, which is their chief nutritive constituent. Oil, pepper, mustard, and a little white wine make the best dressing for beans. It has been proved that some vegetable acid is necessary for the preservation of health, as long continuance in a diet lacking such acids produces scurvy. Vinegar will partly supply this lack, but not wholly, for it will not prevent or cure scurvy. A craving for acid is better satisfied by fruit or acid vegetables. Those young girls who indulge largely in such indigestible articles as pickled limes, cucumbers, etc., would enjoy better health if they should eat instead sour apples, tomatoes,

and rhubarb- and cranberry-sauce. The habitual use of vinegar in considerable quantities leads to dyspepsia; the form becomes wasted, on account of insufficient nutrition; and death has been known to result.

Vinegar is used in medicine for its astringent action, being employed locally to check hæmorrhage. It is also a refrigerant, for sponging the skin with diluted vinegar has a cooling effect. The heat and pain of sprains and bruises are relieved by applying to the place brown paper soaked in diluted vinegar. This use of vinegar is celebrated in the lines of a certain well-remembered lyric:

"And Jill had the job
To plaster his nob
With vinegar and brown paper."

Aromatic vinegar, called also "Vinegar of the Four Thieves," Marseilles vinegar, or camphorated acetic acid, is strong acetic acid, in which are dissolved certain essential oils, and sometimes camphor. It is said to have been used by a band of four thieves, during a plague at Marseilles, to protect them from infection while plundering the houses and bodies of the dead. It is now used only in smelling-bottles, or *vinaigrettes*, for cases of fainting, a bit of sponge or some crystals of sulphate of potassium being put into the bottle and moistened with the liquid. Aromatic vinegar is very fragrant and volatile, and must be kept in closely stoppered bottles. A variety of recipes for it are given: that especially recommended in the "United States Dispensatory" is one and a half fluid drachm best oil of rose-geranium, fifteen minims oil of cloves, and four fluid ounces glacial acetic acid.

The tough, leathery substance, commonly called "mother," which forms in vinegar, is one of the many fungi whose spores float in the air, settle as dust on exposed objects, and fall into exposed liquids, ready to grow into a bulky plant when conditions favor. The exact position of the vinegar-plant among the fungi has not been settled. Turpin, Berkeley, and others, say that it is the abnormally developed mycelium, or vegetative part, of *Penicillium glaucum*, of which common mold is the reproductive part. Pasteur and others maintain that it is a distinct species, calling it by the name *Mycoderma aceti*, and state that common mold frequently grows on its surface. Under the microscope it has been found to exhibit two forms — the minute, rounded particles called micrococci, and the rod-like forms known as bacilli. The vinegar-plant develops during the process of acetification, and its presence tends to accelerate the operation. Manufacturers get rid of it as soon as possible, for it interferes with the flow of the vinegar through their apparatus. It grows on the surface of the vinegar, and if not disturbed will cover the whole surface, conforming to the shape of the vessel. It has been known to reach a

thickness of half an inch. The mycoderm seems to have an oxidizing action, and so, when the alcohol in the liquid fails, it probably grows at the expense of the acetic acid, converting it to carbonic dioxide and water. There is a popular notion that the presence of "mother" shows that the vinegar is made from cider, and is of good quality, but the vinegar-plant appears also in vinegar made from molasses, and it is really as undesirable in vinegar as mold on bread.

The little, wriggling creatures which swarm in some vinegars have been credited by uneducated persons with being the "life" of the vinegar. In one sense they are, but their presence is in no way beneficial. These vinegar-eels (*Anguillula aceti*), as they are called, are developed in most fruits, and hence readily find their way into vinegar made from fruit-juices. Vinegar which contains them must contain also as impurity some mucilaginous or albuminous matter, or the eels would have no food and could not exist. They need air also, and they have been observed engaged in a curious struggle with the mycoderm on the surface. The plant tends to prevent their obtaining the requisite supply of air, and the eels were seen combining their efforts to submerge it. They may be killed by heating the vinegar to 128° Fahr., or by adding boracic acid. Vinegar when long kept, especially if exposed to the air, putrefies and becomes ropy, losing its acidity, and acquiring an unpleasant smell; the presence of the vinegar-plant, vinegar-eels, or other foreign substances, is liable to induce putrefaction, especially if the vinegar is weak.

THE WEEK OF SEVEN DAYS.

By THE BISHOP OF CARLISLE.

IF a being from another world, suddenly placed among us, should examine terrestrial institutions, he could scarcely fail to inquire why it is that in so large a portion of the earth time is measured by periods of seven days. To a large number of persons among ourselves such inquiry is practically superseded by the consideration that the Bible opens with the recognition of the week: whatever discussion may be raised, and whatever may be the demands of science with reference to the interpretation of the commencement of the book of Genesis, the fact remains that it is asserted that in six days God created the heaven and the earth, and all things in them, and rested on the seventh day. The same assertion is renewed by the fourth commandment, which enjoins the keeping holy of the Sabbath-day. And when we remember how thoroughly the sanctification of one day in seven has been adopted and enforced by the practice of the Christian Church, and how the first day has been marked, in virtue of the chief article of Christian faith, as emphatically the *Lord's Day*,

we can not be surprised to find that with most persons any speculation which transcends the limits of the facts just noticed is likely to meet with small encouragement.

Nevertheless, when we observe the necessarily hyper-historical character (if I may coin such a phrase) of the Mosaic cosmogony, as it is sometimes called; when we perceive, as we must upon consideration, the impossibility of interpreting the sacred narrative without some reference to the knowledge already possessed by those to whom it was given—we shall probably come to the conclusion that the reference to the creative work and the seventh day's rest of God does not exhaust the question of the existence of a seven days' week. Therefore, as it is manifestly impossible to detach the ordinary week of a large portion of the world from the history contained in Genesis, and as it is equally impossible to find in that history a complete explanation of the phenomenon, I have thought it might be interesting to examine the subject a little more closely, and see what light can be thrown upon it.

I begin my investigation with a few remarks upon what may be described as *favorite numbers*. There are certain numbers with which we meet more frequently than others, and of which we make more use in dealing with common things. The most favorite may, perhaps, be said to be *ten*, *twelve*, and *seven*.

The reason why *ten* is a favorite—perhaps the most favorite—number is obvious enough, namely, that we have ten fingers. When we begin to count we almost of necessity do so with our fingers; if we have a large number of things to count, say a flock of sheep,* we instinctively divide them into *tens*, or perhaps into *scores;* if the number of things be very large, the collection of tens are naturally grouped again by tens, and so we have hundreds. A further grouping of hundreds leads to thousands, etc. Thus we get the ordinary system of enumeration, and there can be no manner of doubt that man's ten fingers are the root of it. We are told in treatises on arithmetic that it would have been much more convenient if we had agreed to count by twelves instead of by tens; and possibly this may be true. But if it be, we have so much the more evidence, if evidence

*I have taken the counting of sheep as an example, not merely because such counting would necessarily take place in the earliest times, but also because we happen to know that the reckoning of sheep by tens or by scores was effected in olden days, and is effected still in many places far distant from each other, by the help of numerals, which appear to be appropriated to this sole purpose. In a paper headed "Sheep-scoring Numerals," and published in vol. iii, p. 385 of the "Transactions of the Cumberland and Westmoreland Antiquarian and Archæological Society," may be found no less than fifteen varieties of these sheep-scoring numerals as used in Coniston, Borrowdale, Millom, Eskdale (Cumberland), Kirkby Stephen, Epping, Knaresborough, Middleton (Durham), Cornwall, Brittany; in Hebron, Maine, and Cincinnati, among the North American Indians; and in some other places. There is a curious resemblance among the greater number of these numerals, and they all agree in counting by ten.

be needed, that the basis of the system of counting was not determined by theoretical considerations, but by the simple elementary fact of the number of human digits being *ten* and not *twelve*.*

Nevertheless twelve has its turn as a favorite number; we often count by dozens, and the reason probably is that twelve admits of being quartered as well as halved, which in many cases is an advantage. Take the case of wine: a dozen bottles is a convenient quantity to take as a standard, because a customer can order half the standard number, or, if he needs a small quantity, the quarter of the same; in fact, twelve admits of being divided not only by two and four, but also by three and six, which for many purposes give it a great advantage over ten, which can be divided only by two and five, the latter division being rarely of any use. Hence the great divisibility of twelve is sufficient to mark it as a favorite number, but in the most notable instance of its use—namely, as marking the number of months in a year—we need some further explanation. The real month—that is, the number of days between two successive full moons—may be taken as measured by twenty-eight days. Thirteen times twenty-eight makes three hundred and sixty four, or as nearly as may be one year. Consequently, it would have been much more nearly true to say that thirteen months make a year than twelve. The explanation is to be found, I conceive, in the extremely awkward character of the number thirteen; it is what is called by mathematicians a *prime* number; that is to say, it admits of no division of any kind: had there been thirteen months in the year, the half-year and the quarter alike could not have been reckoned by months, and consequently twelve, which, as already explained, is one of the most convenient of numbers in the matter of divisibility, was encouraged and permitted to usurp the place, which, in all strictness, belonged to its next-door neighbor.

There is a somewhat parallel case with regard to the division of the circle into 360 degrees. The ancient Chinese mathematicians divided the circle into 365¼ degrees, corresponding to the length of the year, or 365¼ days, which number, though not exact, is very near the truth.† But this division of the circle is practically intolerable; it would throw mathematicians into despair; consequently the number 360, which admits of being divided by 4, by 60, by 90, and by many other numbers, ursurped the place which the Chinese righteously assigned to the awkward number which Nature suggested.

I now pass on to the consideration of the number seven. It has

* The device of place, according to which the successive figures in writing numbers represent units, tens, hundreds, thousands, etc., as we proceed from right to left, is of Indian origin. The Romans, with all their practical cleverness, did not discover this simple and ingenious device; but they equally testify to the use of ten—or rather of five and ten—as the basis of calculation by their notation of numbers I, V, X, L, C.

† Biot, "Astronomie Physique," vol. i, p. 69.

no such obvious suggestion as ten, and no such recommendation of practical convenience as twelve; nevertheless, it is quite as truly a favorite number as either; perhaps, in some sense, it is more so. Its early occurrence in the book of Genesis might be adopted at once as an explanation of its prominence among numbers; this course of treatment, however, would not fall in with the intentions of this essay, and I shall therefore, in the first place, treat the subject in the most general manner possible, putting out of mind for the moment all thought of the references to the institution of the week which can be found in the Bible.

Adopting this course, we have to deal with the fact that the division of days by seven is both ancient and widespread. If, as has been held by good authorities, the method be of Chaldean origin, the notion that the number seven is connected with the heavenly bodies at once presents itself to our minds as probable; in fact, when we remember that to the early observers of the heavens the planets were seven in number—namely, the Sun, the Moon, Mercury, Venus, Mars, Jupiter, Saturn—and that the names of these planets were in divers countries connected with the several days of the week, the conclusion that the measuring of days by sevens took its rise from the physical fact that seven planetary bodies are visible to the naked eye must seem to be almost irresistible.

The reader may be referred upon this subject to a lucid article, s. v. "Week," in Smith's "Dictionary of the Bible." The writer says:

> Whether the week gave its sacredness to the number seven, or whether the ascendency of that number helped to determine the dimensions of the week, it is impossible to say. The latter fact—the ancient ascendency of the number seven—might rest upon divers grounds. The planets, according to the astronomy of those times, were seven in number; so are the notes of the diatonic scale; so also many other things naturally attracting observation.

And again:

> So far, then, the week being a division of time without ground in Nature, there was much to recommend its adoption. When the days were named from planetary deities, as among first the Assyrians and Chaldees, and then the Egyptians, then, of course, each period of seven days would constitute a whole, and that whole might come to be recognized by nations that disregarded or rejected the practice which had shaped and determined it. But, further, the week is a most natural and nearly exact quadri-partition of the month, so that the quarters of the moon may easily have suggested it.

The argument contained in these passages is somewhat weakened by the mixture of other considerations with those of an astronomical origin. The reference to the diatonic scale, for example, appears to be anything but a help—the more so, as the diatonic scale was unknown to the ancient people of the world, and is unrecognized in the East at the present time. Still more injurious is the indefinite reference to "many other things naturally attracting observation." The connection of the

number seven as determining the division of time with celestial phenomena comes with a much greater air of probability when presented pure and simple: the rising and setting of the sun determined the days; the waxing and waning of the moon determined the months; and the position of the sun among the fixed stars divided the years. So that when it is suggested that the number of planetary bodies settled the length of the week, it is impossible to deny that the proposal comes before us with much *a priori* probability.

It is not necessary to refuse all sanction to the notion that the happy fact that $4 \times 7 = 28$, or that four weeks, each of seven days, roughly constitute a month, and that so, the artificial division of weeks had a convenient relation to the natural division of months, had something to do with stamping the number seven as the basis for the counting of days. Nor would it, perhaps, be possible to entirely deny the position of one who should argue that this convenient quadri-partition of the month was first in order of time, and that the dedication of the seven days of the week to the seven heavenly bodies followed afterward. I do not suspect that this actually was so; yet if it were asserted to be the more probable course of things, I do not know that the assertion could be positively disproved. But, whichever may have been the actual order of proceeding, what I desire now to enforce is equally true, namely, that the two astronomical considerations, namely, the number of planetary bodies known to the ancients and the period of the moon, may be regarded as co-operative, and as tending together to fix more distinctly the number of days in the week.

It would be entirely in accordance with the spirit of ancient religion, or superstition, to connect the days of the week, when once settled down to the number seven, with the thought of dedication to different deities, rather than with the mere fact of the existence of seven planetary bodies; and this state of things we find in the days of the week as used in the Roman Empire and among our Norse and Saxon ancestors. One may perhaps venture to guess that such an adaptation as this would naturally take place in any polytheistic country, which adopted the division of the days by seven; the more so, as several of the seven planets are not conspicuous as phenomena; and so the number seven, as derived from the heavens, would commend itself chiefly to the few who carefully observed, and would not be deeply impressed upon the people at large. The few would observe the planets, and dedicate the days to planetary deities; the many would know nothing about the planets, would regard the days as sacred to their gods.

Having thus far dealt with the week on general grounds, I now pass on to make some remarks upon it in connection with Holy Scripture.

In the first place, as has been remarked by the commentators, and as is apparent to careful readers, it would seem that some notion of the week of seven days was current among the people whose history

is recorded in very early times; that is to say, at a date long preceding Moses or any of the books written by him. The proof of this is to be found in such passages as the following: Genesis xxix, 27, where Jacob is desired by Laban to "fulfill her week," that is, Leah's week, in order that he might also receive Rachel. The week appears to express the time given up to nuptial festivities. So afterward, in Judges xiv, where Samson speaks of "the seven days of the feast." So also on occasion of the death of Jacob, Joseph "made a mourning for his father seven days" (Genesis l, 10). But "neither of these instances," as remarked in the article to which reference has been already made, "any more than Noah's procedure in the ark, go further than showing the custom of observing a term of seven days for any observance of importance. They do not prove that the whole year, or the whole month, was thus divided at all times, and without regard to remarkable events." They do not, indeed, prove this, but they suggest the division as common and familiar, and in some early period recognized as an institution.

When, therefore, the children of Israel went down to Egypt for what proved to be a very long sojourn in that country, they possibly were familiar with the practice of dividing time by weeks, and at all events the notion of seven days as a convenient portion of time for the affairs of life would not seem altogether strange to them. It is exceedingly probable that on arriving in Egypt they found the week established by the practice of the country. It will be observed that it was in Egypt that Joseph mourned seven days for Jacob; and it is possible, though there seems to be no necessity to assume the fact, that in so doing he was conforming to the custom of the country, as he did with regard to the embalming and chesting of his father's remains. But independently of any such consideration, it would seem highly probable that the Israelites found themselves in Egypt among a people who divided the time by weeks of seven days. We know that they did so at a later period; why might they not have commenced as early as before the sojourn of the Israelites? The Egyptians were in fact a people very likely to be advanced in such a matter as this; order and government, both ecclesiastical and civil, were undoubtedly in a remarkable state of perfection at the time to which reference is now made; and it would seem much more probable than otherwise that so convenient an institution as the subdivision of the month into short periods had already been established.

It may be noted, with reference to the number seven and its recognition in some form or another as a special number among the Egyptians, that we have incidental evidence in the dream of Pharaoh; the special form of the dream, as presenting seven fat and seven lean kine, may be supposed to have been connected with some familiarity in Pharaoh's mind with the number seven during his waking hours.

And as regards the Israelites, it may be observed that the period

of seven days is introduced into the most solemn event of their Egyptian sojourn, namely, the ordinance of the Passover: "Seven days shall ye eat unleavened bread; even the first day ye shall put away leaven out of your houses, for whosoever eateth leavened bread from the first day until the seventh day, that soul shall be cut off from Israel. And in the first day there shall be an holy convocation; and in the seventh day there shall be an holy convocation to you; no manner of work shall be done in them, save that which every man must eat, that only shall be done of you" (Exodus xii, 15, 16). And a little farther on, in the chapter from which the preceding passage is quoted, there is an apparent reference to the division of the month into four weeks, as the recognized method of division: "In the first month, on the fourteenth day of the month at even, ye shall eat unleavened bread, until the one-and-twentieth day of the month at even. Seven days shall there be no leaven found in your houses" (Exodus xii, 18, 19). Here we have seven mentioned as well as its multiples: seven, fourteen, twenty-one, and the month or twenty-eight days. It is difficult not to believe that either in consequence of Egyptian custom, or their old Syrian tradition, or both combined, the Israelites were at this time familiar with the notion of a week of seven days.

But there is evidence that not only was the week known to the Israelites, but also the ordinance of the Sabbath, early in their wanderings. The Sabbath does not appear to have been ordained for the first time when promulgated from Sinai. In Exodus xvi we read concerning the manna, "To-morrow is the rest of the holy Sabbath unto the Lord." Again: "Moses said, Eat that to-day; for to-day is a Sabbath unto the Lord; to-day ye shall not find it in the field; six days ye shall gather it, but on the seventh day, which is the Sabbath, in it there shall be none." And, once more: "See, too, that the Lord hath given you the Sabbath, therefore he giveth you on the sixth day the bread of two days; abide ye every man in his place; let no man go out of his place on the seventh day. So the people rested on the seventh day." Thus the promulgation from Sinai was only the republication, and confirming by more solemn sanction, of that which existed already. It should be observed, however, that the appointment of the Sabbath and the institution of the week are two different things: the week might be, and perhaps originally was, a merely secular division of time, like the month and the year; what was done by the teaching connected with the manna, and subsequently more explicitly by the fourth commandment, was to take one day out of the seven and impress a peculiar character upon it. Man, so to speak, made the week, but God made the Sabbath: the week was secular, the Sabbath was religious. If I may venture so to express myself, the task of Moses in forming his horde of Egyptian slaves into "a holy nation, a peculiar people," was a good deal facilitated by this course of pro-

ceeding; if the people, when, in God's providence, he first took them in hand, had been simple barbarians, having no measure of time but the phases of the moon, it would manifestly have been less easy to secure for rest and for religious purposes each seventh day. Why each seventh day? Why not the fourth or the fourteenth? But if the people had their almanac ready-made, and if they had been accustomed in Egypt to measure the time by weeks and to find each day of the week as weary as the rest under their cruel taskmasters, they would readily accept and rejoice in a law which made the concluding day of each week a day of rest and rejoicing. And in fact we find in the Deuteronomy version of the fourth commandment this pertinent exhortation: "Remember that thou wast a servant in the land of Egypt, and the Lord thy God brought thee out thence through a mighty hand, and by a stretched-out arm: therefore the Lord thy God commanded thee to keep the Sabbath-day" (Deuteronomy v, xv).

Let us now turn for a moment to this same commandment as we find it in the twentieth chapter of Exodus, and as it is commonly cited. The most remarkable feature in the commandment, as here given, is the reference to the six days' work and the seventh-day rest of the Almighty Creator. Upon this work of the creative week I shall have more to say hereafter; but at present let me observe that the form of the commandment, beginning "Remember the Sabbath-day to keep it holy," seems to imply that previous knowledge of the week and the Sabbath, of which we have already found evidence. It is very unlikely that the notion of a seventh-day Sabbath would have been announced for the first time in such fashion; in fact, we have already met with distinct teaching on the subject. Let it be added, however, that it has been supposed, and the supposition is reasonable, that the argument for keeping holy the Sabbath-day, founded upon the history of the Creation, which appears in the twentieth chapter of Exodus, does not belong to the original form of the commandment. The fact of its omission in Deuteronomy, and the addition in that version of the commandments of an appendix to the law of the Sabbath-day, which does not appear in Exodus, seems to set us free to suppose that both the one addition and the other were made subsequently, and did not belong to the commandment when given from Sinai. Indeed, there is much internal probability to recommend the suggestion of Ewald (approved by Canon Cook in the "Speaker's Commentary" as "deserving respect"), that the ten commandments were originally given in the following terse form:

1. Thou shalt have none other God before me.
2. Thou shalt not make to thee any graven image.
3. Thou shalt not take the name of Jehovah thy God in vain.
4. Thou shalt remember the Sabbath-day to keep it holy.
5. Thou shalt honor thy father and thy mother.
6. Thou shalt not kill.

7. Thou shalt not commit adultery.
8. Thou shalt not steal.
9. Thou shalt not bear false witness.
10. Thou shalt not covet.

Certainly, so far as the fourth commandment is concerned, it is highly improbable that in its original promulgation it should have been enforced by an argument depending upon knowledge of the creative week, contained in a book, of the existence and publication of which at that time there is no kind of evidence.

I lay stress upon this point, because I believe, and desire to suggest to the reader, that the actual history of the week and of the Sabbath is by no means that which the mere reading of the Bible, commencing with the first chapter of Genesis, might suggest to our minds. The book of Genesis describes the first condition of things, and speaks of the Creator as having spent six days in making the universe, and as having then rested on the seventh day, and having hallowed it; from which description it might seem natural to infer that we have here the history of the institution of the week and of the Sabbath as the close of it; and there are in fact writers who suggest that this institution was delivered to Adam, and came down from him by tradition to subsequent generations of men. Thus, in the "Speaker's Commentary," on the words of Genesis ii, 1, "*God blessed the seventh day*," Bishop Harold Browne remarks, "The natural interpretation of these words is that the blessing of the Sabbath was immediately consequent on that first creation of man, for whom the Sabbath was made." This may be so; but when we endeavor to realize what is meant by the creation of man and the institution of the Sabbath being coeval, it is difficult to express the meaning in intelligible language. The keeping of the seventh day as a day of rest, involves the counting of six days, and then the dealing with the seventh day in some manner different from that in which the first six have been dealt with. Can we quite conceive of such a course in the case of the first man? Supposing him to have come into instantaneous existence in all the perfection of his human intelligence—a supposition which is beset with difficulties and is opposed to the belief of almost all who have studied the subject—is it possible to conceive of the newly formed man as at once comprehending the division of days into weeks, and the consecration of one day above another; or is it possible to conceive of him as capable of receiving a revelation which should convey this knowledge to his mind? If, as all the phenomena of history and of science indicate, the growth of man in knowledge of all kinds has been slow and gradual, then it must be reckoned as incredible that so refined and comparatively complicated arrangement as the division of time by weeks and the keeping of a Sabbath should have been the property of the earliest representative of our race.

So far as Holy Scripture itself is concerned, it will be observed

that it is nowhere hinted that Adam had the knowledge imputed to him. The hints of something resembling the knowledge in patriarchal times have been already noticed, but these may very well be explained by reference to the natural growth of human knowledge, rather than to the hypothesis of a primeval tradition.

Having laid the foundations which are to be found in the previous part of this paper, I now address myself to the consideration of the week as we find it in the opening of the book of Genesis.

I propose to argue that the week did not take its rise from the sacred history, but that, contrariwise, the form in which that history was cast depended upon the knowledge possessed by the writer of the division of time by weeks, and of the institution of the Sabbath.

It will probably be admitted by all that the account of the creation given in the book of Genesis was not the result of scientific investigation. I am not wishing to raise the old question how far the account is consistent with scientific truth—this question does not now concern us—but am only asserting that the creative history can not be regarded in the same manner as that in which we regard a scientific treatise. It is either a speculation, or a poetical picture, or the record of a vision accorded to some gifted seer. Whichever it be, when the author of the written document which we possess came to put down in words his speculation, or his poem, or his vision, he would have to consider, or rather he would instinctively know, what kind of framework he should adopt in order to convey his thoughts to others. Compare the case of Moses, or the author of the original document which Moses used, with that of St. John the Divine. In the Apocalypse St. John speaks of things which he saw in his vision: there were candlesticks, and thrones, and choirs clothed in white garments, and the city of Jerusalem, etc.; all these were things with which he was familiar, and so his vision adapted itself to and formed itself upon these familiar things. No one will for one moment maintain the objective existence of these earthly things in that heaven into which St. John was permitted to peep through the open door; the vision was, in fact, of necessity to a great extent subjective; it is of the very nature of visions that this should be so. If, therefore, a vision of so absolutely transcendental an event as the creation of the universe be permitted to the mental eye of mortal man, that vision, when imparted to others, must clothe itself in such knowledge as the man himself possesses. And as the man, when he comes to record his vision, will instinctively use his own language—Hebrew, Greek, Latin, whatever it may be—to express himself, so also all other furniture of his mind will be naturally put into requisition in order to describe what he has seen.

This being conceded, let us suppose Moses himself to have been the speculator, poet, or seer to whom the vision of creation was for the first time vouchsafed, and let us suppose that the division of time

by weeks was a matter of familiar knowledge to Moses. Then, this being so, it is quite intelligible that the successive works of creation, beginning with light and culminating in man, should fit themselves, as it were, into the framework which the division of the week supplied. *Some* framework would manifestly be required, and *this* framework would be ready-made.

There would be an advantage in this presentation of the week, which would be analogous to that which belonged to the whole Mosaic cosmogony, as a testimony against idolatry. The tendency, to which the nations almost universally fell victims, was to worship the heavenly bodies; but the story of creation, as given to the ancient church, distinctly asserted the creature character of these bodies, and with great and emphatic distinctiveness man's superiority to them all; the first chapter of Genesis was an eloquent protest against the worship of the host of heaven; and so, if there was a tendency to connect the days of the week with this same kind of false worship, by giving one day to the sun, another to the moon, and so on, nothing could more effectually cure this error than the appropriation of the days as representative of the stages of operation in the creative work of the one supreme God. The days did not belong to the planets, owed no allegiance to them, and were not influenced by them, however it might be true that the method of reckoning them was due to the number of these bodies; they were simply the first, second, third . . . days; all were alike except the seventh, upon which a special character was impressed. And it may be remarked in this connection that the Israelites never adopted the heathen practice, almost if not quite universal, of designating the days of the week by the names of the planets or of deities; to an Israelite Sunday was the first day of the week, and nothing more; the seventh day was the Sabbath, and the sixth was the day of preparation, but no taint could be found the whole week through of anything which could be twisted or perverted to idolatrous ends. The Christian Church has not thought it necessary to take so much precaution; bearing in mind that through her Lord the idols have been "utterly abolished," she has not feared to suffer to remain in her nomenclature some of the relics of the heathen past. When the Society of Friends endeavored to substitute the Jewish system for that which is current in Christendom, it was felt that the effort was unnecessary and unprofitable, and it has consequently failed outside their own body. The mongrel method of denoting the days of the week, which prevails throughout Europe, varying from one country to another, but mongrel in all, can not be defended upon any except antiquarian principles, but may be acknowledged to be free in common use from all taint of superstition or any danger of bringing in idolatry.

I shall be quite prepared to find that the view which has been taken in this essay of the relation of the seven days of Genesis to the

seven ancient planets, will by some be regarded as objectionable, on the ground that it appears to conflict with what appears to such persons to be the literal interpretation of Holy Scripture. It may be said that the sacred writer plainly informs us that God created the universe, the planets included, in six days, and rested on the seventh, and that the number of these days can, therefore, have no dependence on the heavenly bodies which were created upon one of the days. And I quite admit that this kind of difficulty is *prima facie* very plausible; I have felt it strongly myself; I do not wonder that others should feel it. But it may be observed that, when we speak of the "literal interpretation" of this portion of Holy Scripture, we are using language which, when examined, has no definite meaning. The whole history of creation is necessarily supra-literal. "The Spirit of God moved upon the face of the waters." What *literal* meaning is there here? "God said, Let there be light, and there was light." How can this grand description be taken *literally?* "God said, Let us make man in our image, after our likeness." How can we assign to such transcendental language any sense which can properly be called *literal?* And so on throughout the whole creative history. Consequently the literal theory must be simply and completely given up, as in the very nature of things impossible; and the question arises, What shall we put in its place? The answer seems to be, that such a picture or sketch of the origin of things was accorded to the sacred writer, and placed at the head of Holy Scripture, as was fitted to the comprehension of man, and fitted to introduce the subsequent portions of the Word of God. The tenacity with which a large number of persons adhere to what they regard as the "literal meaning" of the first chapter of Genesis, proves with what wonderful skill the chapter has been written; but when we come to consider what the literal meaning of the phrase "literal meaning" is, we find that the words are in their nature totally inapplicable to such a composition as that with which we are dealing; and having realized this fact, we may, perhaps, find that there is another mode of interpretation which is more reasonable, more free from difficulties, and which yet deprives the sacred narrative of no particle of its meaning. To supply such a mode of interpretation is the purpose of this essay; if any of those who read it find that it has thrown light upon a dark subject, and assisted them to see their way through a difficulty connected with Holy Scripture, my purpose in writing it will have been abundantly accomplished.*— *Contemporary Review.*

* Nothing that is here said contradicts the principle of St. Augustine's treatise, "De Genesi ad Litteram." The *literal* meaning, in St. Augustine's sense, is in antithesis to the *spiritual* or *allegorical.* I do not think that the great Christian philosopher would have found fault with the views contained in this paper.

THE VOICES OF ANIMALS.

By DETLEV VON GEYERN.

THE whole world is one wondrous blending of the most varied voices, flowing together and intermingling. This unison of sound forms the great tone of life on our globe, and chimes in harmoniously with the poets' and philosophers' music of the spheres. The existence of such a music is not to be denied, even from a purely realistic point of view. If from a distance one were to listen to the thousand noises and sounds of all kinds that arise from the throbbing of life in a large town, these all would seemingly be lost in one low hum resembling the vibrations of a huge tuning-fork, and appearing as but a single tone. Even thus the entire volume of sound coming from our planet would seem as a single tone to one soaring far above the earth, and capable of hearing through vast distances. Similar sounds would arise from other worlds and thus would be produced a veritable music of the spheres, sounding on into the infinite.

Bernardin de St. Pierre has written a very curious book on the harmonies of Nature. Palissy has made numerous ingenious observations on the melodies of plants and trees, which Lamartine, through his book on "Great Men," has rescued from oblivion.

It is a well-known fact that every metal has a sound peculiar to itself. So, too, the voices of animals have at all times played an important part in Nature—now looked upon by man with superstitious awe, and anon observed with the eye of Science.

In olden times the priests and the tillers of the soil were the ones to pay attention to the voices of animals—the priests, to be guided by them in their oracles; the peasants, to learn of changes in the weather and coming storms. It seems rather strange that the observation and the understanding of the voices of animals have become more and more of a lost art with the advance of civilization, so called; and it appears almost an anomaly that in these times a scholar like M. Louis Nicolardot, of Paris, should turn his attention, with all the thoroughness of science, yet in a most charming and entertaining manner, to a study of the voices of Nature. He has done this in a work entitled "La Fontaine and the Human Comedy."

La Fontaine endows Nature with the voice of man, to mirror the manners, the faults, and the vices of mankind. Nicolardot, however, has traced the true and real significance of the voices of Nature, and shows—at times in a surprising manner—that these voices of Nature often express more and bear a deeper meaning than even the fancy of the great fable-writers, from Æsop down to La Fontaine, has ascribed to them. It is very interesting to study more particularly the animal world with reference to its various voices, and to follow out the meaning of these voices in the great concert of Nature. As Nicolardot has

ascertained, there is more dumbness in the animal world than is generally supposed. This dumbness, however, is rarely absolute, but rather more an inability to form articulated sounds.

Every animal of the higher orders is possessed of some sort of tone expressive of pain or joy, and by means of this it can make itself understood by its kind. Fish can produce no sound in the water, because air is lacking as a medium to propagate the waves of sound; and yet we incline to the belief that the water itself may admit of the forming of some kind of sound-waves, which the fish perhaps may be capable of exciting, and which will be experienced and comprehended by other fish. As far as we are concerned, of course, fish will remain mute, as the element in which they live is one into whose conditions of existence we may never enter, and that to us means death. But even among our domestic animals, the dog heading the list, there reigns, to our ear at least, a dumbness well-nigh absolute, broken only occasionally by faint and forcibly uttered sounds. In very cold and in very hot climates there are certain dog races that never bark, a fact already referred to by Captain Cook in the account of his voyages. In Asia there is a species of dog called *colsuns* which never barks. It is to be found chiefly in the Deccan, in the mountains of Nilgiri and in the woodlands on the coast of Coromandel. Also among the birds, by poets so often styled "the singers of the forest," there are many kinds that are mute. Two varieties of sparrows, the *tangara* of Brazil and the *senegali* at the Senegal, are said never to emit a sound; and in Australia there are larks quite similar to those of our own country, but which never sing.

The real singing of birds is done only in spring-time, to greet anew Nature's awakening. During the rest of the year even the best singers of the woods confine themselves to simple chirping notes of woe or joy. Nicolardot believes that the song of birds may be regarded as the original fount of all music, and according to his view each musical instrument was originally only devised to imitate the voice of some bird. Bringing to bear a considerable knowledge of natural history and perhaps an equal amount of charming fancy, he traces the whole orchestra of to-day back to the voices of birds. He demonstrates that for every instrument—the clarionet, the flute, the oboe, the trombone, the trumpet, and all the rest—a bird may be named that bears the fundamental tone of such instrument in its throat, and which has been copied by man in the making of the instrument. To the nightingale he assigns in this bird-orchestra the part of the organ, and even the rattling of the castanets he would trace to the peculiar noise made by some birds of prey with their bill.

Besides their songs with which they greet Spring, and their notes of pain and joy, birds have still other sounds which they use only on certain occasions. Many birds, besides the rooster, herald the early dawn and sunrise with certain peculiar notes. Among these are the

lark, the linnet, the curlew, the plover, the lapwing, and the bittern. Quite a number of birds announce the coming of rain; for instance, the magpie, the owl, the yellow thrush, and the greenfinch. This is also done by means of peculiar notes which they never sound on other occasions. Nicolardot has essayed to reproduce these notes by letters. There also are storm-birds, so-called *procellaria*, which in a similar manner—that is to say, by the use of certain peculiar sounds—predict the coming of a storm, even a long time in advance. Domestic fowl are often watchful for strangers; especially is this the case with peacocks, who are pretty sure to announce by cries the approach of strangers to house or farm.

Birds thus can feel and announce the coming of rain and storm, and already the ancients ascribed to them the faculty of prediction. In their flight and in their voices indications of coming events were sought. The augurs of old had established a whole science of the flight and the voices of birds. Nor is it improbable that training was resorted to, to aid in procuring such predictions—that is to say, to create favorable or unfavorable omens, whichever might happen to best suit the plans of the priests at the time.

Louis Napoleon, in our nineteenth century, intended to convince the French people, by the aid of a trained eagle which was to have alighted on his head at the right moment, that he was the predestined successor to his great uncle. Nicolardot does not go quite so far as the augurs of the ancients, but he also ascribes to birds a prescience of coming events, especially of approaching misfortune, to which feeling they lend expression by certain peculiar sounds. As an example he cites a tale from O'Meara's "Voice from St. Helena." When the French entered Moscow, this author relates, a great flock of ravens came and settled on the towers of the Kremlin. From there these birds, to which the ancients ascribed great sagacity, came flying down close to the heads of the soldiers, flapped their wings, and kept up a continuous, monotonous croaking. The troops were much disheartened by this occurrence, and feared misfortune. Shortly before the terrible conflagration broke out, all the ravens had disappeared, flying away in great numbers.

Napoleon I paid considerable attention to the voices of animals. O'Meara cites the following from a conversation of the emperor's: "How can we know that the animals have not a language of their own? Does it not seem to be very presuming on our part to deny the existence of such a language, simply because we do not understand it? We know that a horse has a memory, that it can make distinctions, that it shows antipathy and sympathy; it knows its master, and can tell him from the servants, although it sees the master but rarely, and has the grooms for company throughout the day." The emperor related that he had once owned a horse which always succeeded in finding him even when he had hidden among other people. This animal

always showed his joy whenever the emperor mounted him. He would permit but one groom in whose care he was placed to get on his back, but, when this groom was the rider, the whole bearing and movements of the horse were different from what they were when the emperor rode him. In the former case the horse seemed to be fully conscious that his rider was but a subordinate. When the emperor had lost his way while out riding or hunting, he simply placed the reins on the neck of this horse, and he had always speedily and surely found the right way. Whenever the emperor approached, the horse gave expression to his joy by a special sort of neighing, and often it had seemed to Napoleon as if the animal were trying to tell him something. Nicolardot, basing his assertion on experience, maintains that each animal has a language of its own, and that it is simply due to the imperfection of our organs that we do not understand this language. In this connection we would mention that Kasper Hauser, the well-known foundling, who had eaten no meat up to his twenty-first year, insisted at the time, shortly after he was found, and before he had grown accustomed to animal food, that he understood the language of all animals, and that very often, when a dog barked or a bird chirped, he knew exactly what was meant. The animals approached him without fear, and seemed to be conscious that he could understand them, but this all came to an end when he began to take animal food. Hence, it might be inferred that the eating of meat tends to remove us from the animal world and to weaken our understanding of its ways. But, if we turn our whole attention to animals, our superior intellect will soon place us in the way of understanding their language.

About 1770 Galliani had two cats which he always kept about him, and away from all other animals. He states that he understood them perfectly, and that they had a complete language of their own in which they always expressed the same wish and the same feeling by exactly the same sound. Lucian observed the common house-fly, and also maintains that this insect, so greatly despised and persecuted, possesses a complete language—that is to say, uses certain sounds in its buzzing to denote certain things, and in this way makes itself understood among kind. Lamartine, in his descriptions of travels in the East, tells of Arabian horses that used certain definite sounds to express certain things, just as Napoleon relates of his steed.

Birds, in addition to the sounds peculiar to them, are gifted with a great talent for imitation. There is hardly a bird, provided it has any voice at all, that can not imitate, at least to a certain extent, the sounds of Nature. Birds attempt to imitate each other, the voices of other animals, and in fact all possible sounds. Parrots are able to make a noise like that produced by a saw, the sound of a cork drawn from a bottle, and other noises still more peculiar. The mocking-bird is a perfect plagiarist in the feathered world; he imitates almost all songsters, even the nightingale. The kingfisher can reproduce most

accurately the cackling of hens, the barking of dogs, the quacking of ducks, and the bleating of sheep. Birds as well as mankind are apt to be vain of their voices and seek to excel one another. Especially is this the case with nightingales. In a hedge inhabited by them one may often observe that their voices increase two, ay, threefold in strength, and sometimes some of these birds are found with their throats torn—they have simply sung themselves to death! But not only in music have birds been the model followed by man, but also that peculiar and entertaining art, ventriloquism, has been copied from them. Just as many of them sing out boldly and fill the air with their melodies, others form their sounds without opening their bills. The pigeon is a well-known instance of this; its cooing can be distinctly heard, although it does not open its bill; the call is formed internally in the throat and chest, and is only rendered audible by resonance. Similar ways may be observed in many birds and other animals. The clear, loud call of the cuckoo is, according to Nicolardot, only the resonance of a note formed in the bird. The whirring of the snipe, which betrays the approach of the bird to the hunter, is an act of ventriloquism. The frog also is said not to open his mouth in croaking, but to create his far-reaching sounds by the rolling of air in his intestines. Even the nightingale has certain notes which are produced internally, and which are audible while the bill is closed. So even the art of ventriloquism (if we may call it an art), which is nowadays but little practiced, but which in former times was highly esteemed, has been taught to man by the animals.

Human society seems attractive to birds, as Nicolardot proves by numerous instances; especially have song-birds a great fondness for human dwellings, and rarely do they go far away from them. It almost seems as if they were vain of the admiration bestowed on their song. They lay and hatch better in parks than in woods. Nicolardot says that the cuckoo, the crow, the quail, and the lark, never live in districts entirely untenanted by man. There are quite a number of city and village birds which always settle in the immediate neighborhood of human dwellings. Among these are the starling, the nightingale, the finch, and the sparrow, but above all the stork. All of these birds are said to imitate, by their calls or their song, the human voice, or else noises which are to be heard about dwellings. For instance, it is said that the stork in Africa—though this we would not like to vouch for—is dumb, and that his clappering here is but an imitation of the sharpening of scythes. This sound is supposed to be specially pleasing to the stork, because on freshly cut meadows he always finds food in plenty, and therefore it is presumed that he imitates this noise as suggestive of a rich dinner. All of these birds show great fondness for, and are said to be capable of imitating, the human voice, if one were only to take sufficient pains in training them. And, more than this, they can repeat entire words like the parrot. That starlings and

ravens can talk is a well-known fact, but instances are known where other kinds of birds have learned to speak. Russ, for instance, in his book on ornithology, tells about a canary, owned by an actress, which was capable of speaking some words distinctly.

Other birds have a special liking for certain sounds—owls, for instance, like the tolling of bells. Nicolardot says that a special variety of owl, the "tower-owl," which preferably nests in bell-towers of churches, closely imitates in its cry the sound given out by bells. He also states that it is a comparatively easy matter, calling only for a little trouble and patience, to teach the greenfinch and the yellow thrush to talk. Song-birds especially are said to be capable of a musical education much more extensive than they commonly receive nowadays. They are said not only to be able to repeat short melodies whistled to them, but also to sing to the accompaniment of instruments. Maximus, of Tyre, relates, in his "Philosophical Conversations" (translated by Torme), that a certain man, who devoted much of his time and attention to animals, had kept a number of birds of different kinds in his room. Every morning during the beginning of their captivity they sang and chirped—each in its own way—giving rise to much noise and great confusion. In a comparatively short time, however, this man had succeeded in training his birds so that they joined him in making music. He played the flute, and the birds accompanied his playing with their voices, at certain passages all singing correctly in chorus. The responsibility for the truth of this story we must leave to the narrator; however, it is a fact that, in the musical training of birds, wonderful things may be done.

During the time of Napoleon III, there was at Paris a so-called *charmeur* who came every noon into the garden of the Tuileries and fed the birds of all kinds. The animals knew him by sight, and came to him at once. He could call them individually, and they would perch on his fingers, and, if he whistled certain signal-notes for them, they would repeat these clearly and distinctly.

In these days we are ever seeking and searching; we penetrate deeply into all domains of Nature, and believe ourselves to be approaching to a more true conception of the world about us. But rarely has it been seriously attempted to study the voices of Nature, which form so important a chord in the great concert of creation. Undoubtedly there is here yet much that lies unrevealed, and that is well worth attentive study and investigation. Perchance this might lead to important conclusions concerning the great secret of life in its organic function, which nowhere draws a sharp line between the animal and the vegetable kingdom, and which joins the latter by insensible gradations to the mineral world. The first attempt in this direction has been made by Nicolardot with his work, and this well merits our interest and appreciation.—*Translated for the Popular Science Monthly from Ueber Land und Meer.*

SKETCH OF NICHOLAS PREJEVALSKI.

THE Russian explorer, Prejevalski, had returned, at the beginning of 1886, from his fourth journey of scientific investigation and military reconnaissance in Central Asia. His activity and its fruitfulness in the extension of knowledge are truly wonderful.

NICHOLAS PREJEVALSKI is now in his forty-seventh year, having been born on the 31st of March, 1839. He was the son of an old Polish landholder in the province of Smolensk. Having attended the gymnasium of his native province for a time, he entered the Military Academy in St. Petersburg, and devoted himself to the natural sciences. He was engaged in the Polish campaign, and afterward resided at Warsaw, as teacher of history and geography, till 1867; then, at his own request, he was transferred to Irkutsk, in Eastern Siberia, whence he undertook journeys to the Amoor and Ussari. This remote region exercised such a power of fascination over the young man that the starting-point of his whole career may be dated from his residence there. It gave the first response to his natural taste for traveling in strange lands, and we therefore find it perfectly in course that he should have started in 1870 upon a longer journey through China. The expedition was undertaken under a commission from the Geographical Society of St. Petersburg, in company with Lieutenant Michael Pylzow and two Cossacks, and lasted three years. In its course it traversed Mongolia, Shan-Su, the basin of the Kuku-Nor, and Northern Thibet, for a distance of more than seven thousand miles. The literary fruit of this expedition was a book of "Travels in Mongolia in the Tangut Country, and the Solitudes of Northern Thibet, 1870–'73," which was published in London in 1876, translated by E. Delmar Morgan, and furnished with an introduction and notes by Colonel Henry Yule.

The journey was directed to the regions lying outside of the great Chinese wall, a country concerning which our data, derived chiefly from the accounts of Marco Polo in the thirteenth century and of a few missionaries, were so defective and inaccurate, that the whole table-land of Eastern Asia, extending from the Siberian mountains in the north to the Himalaya in the south, and from the Pamir Plain to China, was as little known to us as Central Africa or the interior of New Holland. This region, then a *terra incognita*, exceeding the whole of Eastern Europe in extent, situated, to borrow the words of the explorer, in the middle of the greatest continent, at an absolute height with which no other region on the globe could compare, here intersected by giant mountains, there spread out into illimitable desert plains, presented in every aspect features of scientific interest. But, he added, strongly as these regions attract us by the mysteries which they conceal, they equally deter us by the threat of all possible

hardships. On one side looms up the desert, with its sand-storms, its dearth of water, its heat and cold; on another side, the European encounters a suspicious, barbarous people, who will meet him in ambush or be his open enemies. After three years of contention with these difficulties, he had the rare fortune of reaching the Kuku-Nor and the upper waters of the Yang-tse-Kiang River in Thibet. He had only to lament the insufficiency of his outfit, a matter of great importance in all explorations. Yet, with the means he had, he carried the line of his journey thirty-three hundred miles forward with the aid of a hand-compass, defined eighteen meridians on his map, and observed the magnetic variation at nine points and the horizontal deviation at seven. Meteorological observations were taken four times a day, the temperature of the ground was tested frequently, and hygrometric observations were taken several times. Special attention was given to physiographical investigations and the examination of the mammals and birds, and every opportunity for ethnographical research was improved. The expedition collected specimens of two hundred and thirty-eight species of birds, skins of forty-two species of mammals, a dozen amphibia, eleven species of fishes, and more than three thousand insects. These were all deposited in the Museum of the Academy of Sciences of St. Petersburg. The botanical collections, which were handed over to the Imperial Botanical Gardens, included some four thousand examples, of five or six hundred species. The mineralogical collection comprised small specimens from all the ranges that were crossed.

The route of this expedition was from Kiakhta to Peking, where the outfit was completed, thence along the southeastern border of the Mongolian table-land north of Peking to the city of Dolon-Nor, across the Dulai-Nor Lake to Kalgan and the Yellow River, and thence over an Alpine region and across the Hoang-ho to Ordos in its valley. From this place it went to the marshy Zaidemin Lake, and thence to the Ala-Shan, or the southwestern part of the Desert of Gobi, a barren region, inhabited by a Mongolian tribe, the Oleuts, and to the Ala-Shan Mountains, a range in places exceeding ten thousand feet in height, and which is the home of the musk-ox. High as these mountains are, they possess an abundant animal life. Unfortunately, the explorer's funds were exhausted at this point, and his pass from the Chinese Government extending only to the province of Shan-Su, there seemed to be no alternative but to retire to Kalgan in Southeastern Mongolia. The expedition returned along the left shore of the Yellow River, through the country of the Urotes, visiting on the way the great salt lake Jaratai Dabaru, whence salt is carried to China. The return was beset with many difficulties, but Kalgan was reached at last, and the first part of the expedition was completed, with results on the whole so satisfactory that the travelers, though still in the interior of Asia, determined to undertake a journey to the

farther shore of the Kuku-Nor. It was however necessary, first, to go to Peking and obtain a new outfit. A new pass was granted by the Chinese Government, extending to the Kuku-Nor and the borders of Thibet, and, with two fresh Cossack guardsmen, Prejevalski started back by the same route by which he had come from Ala-Shan to Kalgan. The party had the good fortune to attach itself to a Tangut caravan, which was going to the monastery of Chobsen, within a short distance of the Kuku-Nor, and would be to it as the best of guides, and also a defense against the Dungans, who were making parts of the country very uncomfortable. Having crossed the wilderness of Ala-Shan, to the border ranges of Shan-Su, they came upon a mountain-region, where the high elevation of the land, frequently rising above the snow-line, gave an abrupt and remarkable change to the character of the landscape. Fields and forests were laid out before the explorers, and the flora and fauna offered so many attractions to them that they spent the summer there. These mountains, which the Chinese call Nan-Shan or Sue-Shan, consist of three parallel ranges, and constitute a wild Alpine region, in the forests of which the *Rheum palmatum*, or rhubarb, which was for the first time in modern history seen in its native region, is the characteristic plant, while the belt between twelve and thirteen thousand feet of altitude abounds in rhododendrons. The mountains rise to the height of fourteen thousand feet, but there are no woods on their southern slopes. The Dungans pass for their most savage inhabitants, but they were not bold enough, with all the advantages of numbers on their side to attack our four travelers. All dangers were avoided by watchful care; and at last Prejevalski, getting a view of the Kuku-Nor, was able to say, as he has written in his account of the journey: "The dream of my life was fulfilled;" the long-sought end was reached. What I had just before only dreamed of, had now become reality. It is true that this result had been bought only at the cost of many hard trials, but now all the sufferings we had endured were forgotten, and, full of joy, my companions and I stood on the shores of the great lake, and enjoyed the sight of its marvelously deep-blue waters." On the 12th of October, 1872, he pitched his tent on the shore of the lake, ten thousand five hundred feet above the sea, being the first European who had visited it, except the Jesuit Father Huc. Thibet lay before him as a new object of research, and he hoped to pass over Thibetan land to the upper waters of the Blue River, or Yang-tse-Kiang. He started on the 18th of November, and penetrated into that land along the lofty pass, till he was only about five hundred miles from Lassa, the residence of the Dalai Lama. But, again, the want of money compelled him to turn back. He retired to Zaidam, on the Kuku-Nor, where he remained till spring. In May, 1873, he was again in the Desert of Ala-Shan, which he succeeded in crossing without a guide, and reached the city of Dyu-Yuan-in after a hazardous march of fifteen days from

Dajin. The people of this town, who had seen them before, complimented them on their having grown to look like themselves, or having become quite Mongolian. Prejevalski himself describes the party as exhausted by their arduous march, half starved, with ragged clothes and boots, looking like beggars. Here they entered upon the final stage of their journey through a land which no European had ever entered before them—the heart of the Desert of Gobi, a region "so terrible that, in comparison with it, the Desert of Northern Thibet may be called fruitful; there, at all events, you may find water and good pasture-land in the valleys; here there is neither one nor the other, not even a single oasis; everywhere the silence of the valley of death"—in order to reach the Russian city of Urga, on its border. Finally, Prejevalski reached Kiackta, his original starting-point, on the 19th of September, 1873.

Not satisfied with the results of this expedition, which he regarded as still incomplete, Prejevalsky engaged in the organization of a second one, to be more adequately prepared for its work, which he designated as intended for "a scientific reconnaissance of Central Asia." The objective points of this, his third journey into the interior of the continent, were the Lob-Nor, which no European had ever seen, and the exploration of Thibet. With two Russian companions he went to the valley of the Ili and to the Tarim River, by whose course he hoped to be led to the still mysterious lake. Hence his route was continued to the elevated Altyn-Dagh, the northern outpost of the Kuen-Lun, but he still failed to get into Thibet. To quote from his own narrative: "The examination of the Lob-Nor and of Western Dungaria formed the conclusion of my second expedition into inner Asia. I had, in consequence of the severity of my efforts, and by the operation of climatic influences, brought upon myself a grave illness, which compelled me, instead of returning to Thibet and Hami, to stop at the end of 1877 in our border post of Saisan. After three months of good care, I was restored enough to undertake a new journey. But the expedition was now postponed by an order from St. Petersburg, because of the unpleasant relations that were existing with the Chinese. The delay, however, had its pleasant features for me. I could go to my own home, and there, in the undisturbed quiet of a country life, gain a complete recovery. Here, in this season of rest, the importance of making the still wholly unknown wild regions of the interior of Asia the object of a journey of discovery became clearly fixed in my mind." Thus it came about that he particularly emphasized the exploration of Thibet. His plan was supported by the Geographical Society, and approved by the Minister of War, and he was allowed a subsidy of twenty-nine thousand rubles. His company consisted of twelve persons besides himself: Ensign Ecklon for the zoölogical and Ensign Roborowski for the botanical work; three soldiers and five Cossacks; a subordinate officer and *preparateur;* and an interpreter from Kuldja

for the Turkish and Chinese languages, who had been with him to the Lob-Nor. The baggage, arranged in forty-six packages, was loaded upon twenty-three camels. It included two Mongolian tents and arms of the best manufacture, in the use of which the whole company was carefully drilled. The soldiers and Cossacks were accommodated upon eight camels, and there were four reserve camels. Prejevalski, with the officers and the interpreter, rode on horseback. The party left Saisank on March 21, 1879, directing their course toward the Dungarian Desert, between the Altai and the Thian-Shan. At the latter range the salt-steppes abruptly give way to fragrant forests of larch; the mountains assume a wonderful grandeur, lifting their tops away above the snow-line, and rising like a steep wall out of the plain. Along the northern and southern Thian-Shan extends one of the many oases which wind along like a tortuous chain between the Kuen-Lun, the Altyn-Dagh, and the Nan-Shan—the oasis of Hami in the desert of that name. Through this oasis and that of Sa-cheu, the party proceeded to the foot-hills of the Nan-Shan and into those lofty mountains themselves. Two of the snow-covered outposts of the range, about eighteen thousand five hundred feet high, were named after Humboldt and Ritter. Prejevalski then entered the extensive district of Zaidam, inhabited by Oleuts, where he had formerly sought for the Kuku-Nor. This time it was Northern Thibet, with its table-lands standing at an elevation of from twelve to sixteen thousand feet, and its mountains towering above all their neighbors, that stood foremost in his vision. On his first journey he had struck the route of the Buddhist pilgrims, and had reached the point where the Napchi-Ulan-Muren enters the Mur-Usu, which from there is called the Yang-tse-Kiang. On his second journey he had reached only the northern borders of Thibet. On this third journey he reached the sources of the Blue River (the Mur-Usu), on the Tan-la, and a portion of the Yellow River, and the Kuku-Nor. The significance of this achievement is explained by himself when he writes: "European travelers have to encounter great difficulties in these regions, arising out of climatological and local circumstances. The great absolute height and the consequent rarefaction of the air, with sharp changes of temperature, make the ascent of the pathless heights a toilsome work. The opposition of Nature has to be overcome at every forward step, and the traveler must at all times be prepared for hindrances and hostility of every kind from the people. Only by the application of one's entire physical strength and of extreme energy is it possible to overcome the impediments of these mountains." He left Zaidam on the 12th of September, 1879, taking a route between his old one, over the Burchan-Budda, and the Nomachun-Gol, and along the latter into the home of the yak and the antelope. He purposed to pursue a straight course for Lassa; and the character of his march is sufficiently described when it is said that, during all the time he was in Thibet, he never moved at a less altitude than thirteen thou-

sand five hundred feet! To the difficulties afforded by the elevation were added attacks from predatory tribes, the Jegrais, which had to be repelled by fighting. He was not allowed to visit Lassa, although he was granted an interview with a deputation from the Holy City, who came to his camp at the foot of the Bumsa Mountain, sixteen thousand four hundred feet above the sea. "Again," he sorrowfully writes, "was my effort to penetrate to the capital of Thibet baffled by barbarian prejudices and the fanaticism of a stupid people. Now, when the greatest obstacles had been overcome, when everything had been smoothed away, when I had the object of my desires so near to my eye, I had again to turn back without accomplishing my purpose. It was a severe trial to give it up." He returned, through a moderately high spur of the Kuen-Lun range—which he named the Marco Polo Mountains, after the old Venetian traveler—and another unknown range, to Zaidam. On the 31st of January, 1880, after four and a half months of wandering in Thibet, he entered the station of Dsun-Lassak. This ended the second period of his expedition. The third period was passed in Zaidam, and partly in the Kuku-Nor, whence he undertook a journey of exploration to the sources of the Chuan-Chi, or Yellow River, which he followed from the Kuku-Nor southward into the northeastern spurs of the Thibetan foot-hills. He wanted to solve what had always been a riddle even to the Chinese. He returned to the Kuku-Nor, and struck from it upon the old road from Ala-Shan to Urga, which he had traversed in 1873. The fullest and most accurate information which geography has gained of the regions through which he traveled is what he has given it.

This journey was characterized by Dr. Petermann as the crown of Central Asiatic exploration, and as equal in importance to Stanley's journey down the Congo, or even to the attainment of the pole. Of its results, "Nature" said, in a summary of them, that the traveler's observations would be "of special value to the ethnologist, as containing important details concerning the various peoples he met with. The zoölogist and botanist will also find much to interest him." In its notice of the book, the same journal referred to the part of the narrative describing what the author observed during his stay at Lob-Nor concerning the migrations of birds as being of exceptional value. The Royal Geographical Society, in April, 1879, awarded a gold medal to Colonel Prejevalski, "for the great additions he has made to our knowledge of Central and Eastern High Asia, by his successive expeditions into the unexplored parts of the great plateau of Mongolia and the lofty deserts of Western Thibet, and for the admirable way in which he has described the regions traversed by him in the published narratives of his journeys."

No amount of adventure satisfies a traveler, and Prejevalski was not satisfied with the excursions he had already made. At the close of his book, describing his third expedition, he says: "The joy

with which I again saw my home, after my tedious travels, may be easily comprehended. But the more that every-day life demands its rights, the more actively does the pressure toward the far-off deserts of Asia, which once seen can never be forgotten, the longing to visit them again, rise in my soul. Yes, in those deserts," he added, "an unlimited freedom reigns. The traveler stands opposing the wild robber-hordes with the weapons of science and civilization. The dangers which he encounters every day for his love of science are quickly forgotten, while the recollection of the moment of success and of real happiness remains fixed and clear in the mind. The picture of those past joys floats before him day and night, and entices him, even from the midst of the enjoyment of the rest of civilization, to that life of labor and freedom." This book was published in London in 1879 as "From Kuldja, across the Thian-Shan, to Lob-Nor," translated by Mr. Morgan, with an introduction by Sir Douglas Forsyth.

In 1883, Colonel Prejevalski went on his fourth expedition to the same regions, having the country of the Yellow River as his objective point. He started in November, and, traveling in a cold under which quicksilver was frozen, found himself in February, 1884, again in Thibet. In May he went down to the south of Zaidam, whence, having left his baggage with a guard of Cossacks, he started again for the sources of the Yellow River. They were found to lie in a region uninhabited by man, but peopled by innumerable herds of yaks. Thence he turned to the shores of the Blue River where he suffered an attack from hostile Tanguts. He repelled them, but they succeeded in preventing his crossing the river, and forced him to turn back. They continued to annoy him for several weeks, when he again went back to the headwaters of the Yellow River and the lakes by which it is fed. Leaving Southern Zaidam, he went westward with thirteen persons into a desert where even camels could not live. He came at last to the shore of an impenetrable swamp, which was well inhabited by pheasants. He remained for three months at a place called Gaz, whence he penetrated to a part of Western Thibet, where he discovered three previously unknown mountain-ranges. From Gaz the road went on through a labyrinth of narrow passes and defiles to the Turkoman town of Loto, where the population was friendly. The people of Western China, where it borders on East Turkistan, were likewise well disposed toward him. The country is described as being very attractive, without winter, populous, and as yielding two crops of grain a year.

Colonel Prejevalski's return from his fourth journey was celebrated at St. Petersburg by a special session of the Geographical Society, on the 10th of February, which was attended by members of the imperial family, ministers of state, diplomates, and learned men, all eager to pay their respects to the energetic traveler, who, on this occasion, was made a major-general.

CORRESPONDENCE.

A NOTE ON INDIAN CRANIOLOGY.

Messrs. Editors:

WILL you kindly allow me a few lines of your valuable space in the correspondence column of the "Monthly" for the purpose of correcting an error which you have made in noticing my memoir on "A Navajo Skull," on page 279 of the December (1886) issue of your journal, as well as to make a few comments thereon?

You have ascribed the authorship of my monograph on the Navajo skull to no less an eminent biologist and anthropologist than Sir William Turner, F. R. S., and, as much as I feel honored by your oversight, it had better perhaps be corrected to stand otherwise. Dr. Turner, indeed, is the author of the valuable "Additional Note on the Navajo Skull," which you properly attribute to him. It supplements my memoir and adds thereto information which, owing to my far removal from the literature of such subjects, I could not supply. Dr. Turner kindly rounded off my work for me, and both papers appeared together in the "Journal of Anatomy." He subsequently sent me a few "reprints" of his note, and I sent you a copy, so that you would have the case complete before you.

The only point that you call attention to in your December notice of the memoir in question is, that it relates "to the examination of the skull of a Navajo Indian of about forty years of age, who came to his death by a gunshot-wound of the head." As true as this undoubtedly is, and as common as such specimens are (dead from such a cause!) on the plains of New Mexico, I must believe you have quite overlooked the two important points I endeavored to bring out in the paper. The minor point which I invite attention to is, that the specimen exhibits a wonderfully interesting example of that *rare* injury, the result of certain gunshot-wounds known to surgeons as "fracture by *contre-coup*."

But the main object of the memoir is widely removed from this and completely ignored by yourselves. From the data furnished by the Otis "Catalogue of Crania," in the Army Medical Museum, I was enabled to present, for the average male Navajo's skull, the cranial capacity, the facial angle, the length, the zygomatic diameter, etc.; and I further tabulated this information in such a way that it became presentable for comparison. I then carefully compared the skull before me with it, and pointed out how it diverged from the *average* measurements as given in the previous data. The plate illustrates the skull seen from the four principal views, and I take this occasion to thank my engravers for the exceedingly handsome lithograph they succeeded in obtaining from my original drawings. The "Journal of Anatomy" has kindly published for me since a similar paper (illustrated), devoted to a like *comparative* examination of the leading characteristics of the skull among Navajo children.

It stands to reason that to devote a handsome plate and the valuable space in the "Journal of Anatomy" simply to the examination of a *single* Indian skull, however meritorious it might be made, would hardly be tolerated; whereas the *comparative* examination of the data brought out through a study of the characteristics of the different tribes of our North American Indians is a subject which I deem to be one of no little importance. R. W. SHUFELDT.

FORT WINGATE, NEW MEXICO,
November 27, 1886.

[The confusion of authorship to which attention is called in the above letter, is the result of the substitution of a period where there should have been a comma, after the word "same." Punctuated as it was intended, the list of pamphlets in the heading of the notice will read as belonging primarily to Dr. Shufeldt, as it should read. The rest of the author's criticism is directed to the fact that we omitted to mention the technical bearings of his observations. Technical details are not within the scope of the "Monthly," and the discussion of them would be appreciated by but a small proportion of its readers.—EDITOR.]

BEETLES AS A NUISANCE.

Messrs. Editors:

THAT many insects have decided odors of their own is known to all who have ever taken the slightest interest in that class of the animal kingdom. Some of them are well known to others, even, who take no such interest—to wit, that of the bed-bug (*Cimex lectularius*). Many have a pleasant, musky smell, and others a very intense, disagreeable, or disgusting odor. Among the latter is one of the largest of the American Coleoptera—the *Dynastes tityus* of entomologists. The insect is two inches or more in length, an inch wide, and stout in proportion, of a pale-greenish color, with black spots. In the male the thorax is furnished with a long horn, and with two smaller horns

at the base of the large one. On the head is another short, upright, pointed horn, giving the insect a very formidable appearance. This insect has a very strong and lasting odor, comparable to that of tobacco steeped in acetic acid. A single specimen placed in a large room will saturate the atmosphere in a single night, and be perceptible for days thereafter. In the larval state this insect resembles an immense "white grub," in form and structure, but is greenish in color. In this stage it feeds on decaying wood. In the vicinity of Memphis, Tennessee, are thousands of stumps of trees cut some ten years since, and now in just the right stage of decay for this larva. As a consequence, the insect has increased to such an extent as to become literally a nuisance. In the month of June or July an intense disagreeable odor was noticed in some outlying sections of the city, becoming stronger in the evening. The Board of Health took action in the matter, drained a few pools, disinfected other unsavory substances, but produced no effects on the odors. Various speculations were rife in the newspapers as to the cause and effect of the odors, until, finally, a correspondent of the "Memphis Avalanche" solved the mystery by finding large numbers of this insect, which were straightway sent off for determination. Later in the season complaints came from Western Virginia of similar foul smells. Here the health officers made war on the pig-pens, without avail, of course, and here, also, in due season, the source of the smell was discovered in this beetle.

The curious part of the matter is, that this insect has been considered not a common one by entomologists, and now it appears in the light of a pest of a quite novel order, polluting the air so as to become a positive nuisance. Whether the odor is at all injurious to health, I can not say. It will cause squeamishness in sensitive individuals, but it will hardly do more. The remedy is, of course, obvious—remove the stumps, and the source of supply is gone; more than this, the stumps remain in condition for the larvæ for a brief period only, and another year or two will see the end of this peculiar nuisance, unless the supply of stumps or logs is kept up.

JOHN B. SMITH.
U. S. NAT'L MUSEUM, WASHINGTON, D. C., *September* 9, 1886.

EDITOR'S TABLE.

POLITICAL SKEPTICISM.

AN able writer in the "Revue des Deux Mondes" has lately drawn attention to the extent to which what he calls "political skepticism" prevails to-day in France. He believes that it exists in large measure in other countries as well; but he deals with it principally as affecting his own country. He says that, while men are still divided into parties, there is no longer the earnest belief in definite political principles which was still to be found a generation or two ago. Men no longer adhere to their party through strong conviction or overmastering prejudice; on the contrary, their party is something with which they make terms, and which they expect to find their account in serving. The Conservative is not so very conservative as he used to be, and the Liberal has a greatly diminished faith in liberalism. Nobody expects much from the logical application of any set of principles; the general disposition is to let things drift and wait to see the result.

The condition of things described seems to us the natural effect of two definite causes: first, the operation of the party system; and, second, the practice of looking to the government as the conservator and manager of nearly all important social interests. If anything could undermine political conviction it would be the party system. Its very basis is the sacrifice of individual convictions to party exigencies. It organizes the purchase of political support, and reduces statesmanship to the ignoble level of trickery and clap-trap. We do not need to go to France for an exemplification of its working. Here, in the United States, it has produced all its choicest effects. So bent are our leading politicians upon party and personal success that it is the rarest thing to detect in their public speeches one

sincere utterance. The art they most sedulously cultivate is that of hedging on all important practical questions; so that they may be left free to take whatever course the shifting winds of public opinion, or the varying exigencies of personal interest, may require. We do not read their speeches for the purpose of knowing what they think, but for the purpose simply of ascertaining what, at the moment, they consider it safe and politic to say. So thoroughly do certain journals recognize that theoretical convictions have nothing to do with politics, that they scarcely hesitate to erect into a principle that politics should be regarded mainly as a scramble for the offices. One of these the other day expressly and most seriously commended the President for having (as was alleged) appointed a cousin of his wife's to a lucrative consulship, the doctrine laid down being that "to the victors belong the spoils," and that the President did the right thing in providing for his own relatives and friends. Such open cynicism is better, perhaps, than a pharisaical and insincere profession of higher principles; but, with such an illustration of political skepticism at hand, we need not go abroad for instances.

In the second place, the altogether undue reliance placed in these days, upon state action for the promotion of the general welfare tends to produce political skepticism through the disappointment that it is certain to produce. An agency of apparently irresistible force is set in motion, and when it fails to yield the results expected of it, men are apt to conclude that those results are unattainable by any means, and they become discouraged. They forget that the only force the state can dispose of is, in the last resort, physical force, and that physical force may not be what is wanted for the ends in view. The state can make laws, and to a certain extent can enforce them, or, at least, exact penalties for their infraction; but the state can not produce right dispositions in the minds of its citizens. The state can organize schools and assume complete control of education, but it can neither give an integral education, nor can it infuse a right spirit into the system that it administers. It can not do the former, on account of the great diversity of opinions existing throughout the community on various fundamental questions; it can not do the latter, partly because it can not do the former, and partly because political considerations of a low order are constantly intruding into public-school management. The state can undertake great works, but it can not make great men, or make men great; and after it has controlled for a certain length of time of any special sphere of action, we may look there with confidence for conspicuous examples of inertness and incapacity. Another evil is that the vast apparent power of the state leads to the cherishing of extravagant hopes and expectations. Men would not expect great reforms in a year or two if they did not count on legislation doing wonders for them. In spite of multiplied proofs to the contrary, they think that, if they can only get a law passed, all the rest will follow of itself. And so, as in the State of Maine, they get a law passed, and then spend forty years in tinkering at it, in the vain effort to find out why it won't work, or why it works in a direction opposite to what they intended.

The remedies, therefore, for political skepticism are obvious. Let us, in the first place, abate the excesses of the party system, and for the future, instead of striving to keep all great public questions "out of politics," let us try to get them into politics; and then let us deal with them with an eye to the greatest good of the nation at large. No doubt there will be differences of opinion as to what is best to do; but, the more there is of honest

conviction on such questions, the less there will be of "political skepticism." The mere conflict of opinions will never produce civil discord; it is when theories, in the strict sense, are flung aside, and *interests* confront one another in battle array, that real danger arises. The question is simply, Shall we or shall we not consult together like loyal citizens for the good of the state? If we determine to do so, we raise politics at once to the level of as noble and honorable a pursuit as any man can engage in. Our object, then, is truth in its application to national affairs, and politics becomes a branch of science. If, on the other hand, we can not, as citizens, summon up enough disinterestedness to think and labor for the general good, but allow ourselves to be marshaled into parties fighting for no determinate object save the spoils of office or the vain satisfaction of a party triumph, then, truly, the reign of political skepticism must ever become more absolute, and the country be brought yearly nearer to the edge of a dangerous convulsion.

We think there are signs of an awakening of the public mind to the evils of the party system; but something more is wanted for a true political equilibrium than the mere cessation of unmeaning party strife. We need to come down to more moderate views of what state action can reasonably be expected to effect. We need a truer perception of the methods by which, and the rate at which, great social reforms are accomplished. We need to repeat to ourselves continually that might does not make right, and that the might of a majority may be as fatally in the wrong as the might of an individual. Before invoking the power of the state, we should ask ourselves whether the case is one in which the power of the state *ought* to be exerted. The doctrine is now all but officially promulgated, that majorities can not possibly do wrong, and therefore that the power possessed by a majority may at any moment be rightly employed to enforce its will. This is political skepticism with a vengeance, substituting, as it does, the ballot-box for the moral law. The notion is one that we must unlearn, as we value our integrity as a people; for no community can long prosper that has once enthroned force in the place of justice. It is impossible to develop fully within the limits of an article like the present the idea here outlined, but we are convinced that many of the most discouraging characteristics of the present day, including the "political skepticism" above specially referred to, are in great part traceable to the growing habit of looking to the state to do things which, if done at all, should be done by private effort and the growth of opinion.

A WONDERFUL ARGUMENT.

We find in "The Varsity," a weekly journal published at Toronto, Ontario, in the interest of Toronto University, a wonderful argument for the perpetual retention of the present arbitrary rules of English spelling. "It is a saddening reflection," says our contemporary, "that there should be men, our brothers, whose limbs should be stiffened by day-long labor of the body, and into whose minds no light shines through their lives; but the desire to utterly obliterate whatever may in any way serve to distinguish the man of culture from his illiterate brother must be looked on in no other light than as one of the many manifestations of that misty socialism which is clouding so many minds to-day." Here is intellectual snobbery with a vengeance. Forsooth, we must keep up a difficult and arbitrary mode of spelling in order that the poor man may spell badly, and so be distinguished from the man of culture! When we first began to read about those unhappy men, "our broth-

ers," whose limbs were stiffened by toil, and whose lives were so destitute of light, we thought the editor of "The Varsity" was about to come forward with some chivalrous scheme for diminishing their burdens and helping the light to penetrate into the dark places. But, no; his cry is, "Keep them down! They can never learn to spell English according to the present rules; so let us see to it that we, the nurslings of culture, the children of light, resist all attempts to introduce any simpler, even though more scientific and more philological, system of spelling. Otherwise what will there be to distinguish us intellectually from those poor, toil-stiffened creatures?" One is tempted to say in reply that, if superiority in the matter of spelling is *needed* to distinguish men of culture from men destitute of culture, then culture itself must be a very poor and unsubstantial thing. Imagine, for a moment, two men, one of whom has had a university education, while the other has lived such a life of bodily toil that no light has shone into his mind; and then imagine, further, the gentleman of the first part asking that spelling may be kept a difficult and mysterious art, in order that there may be something to distinguish him from his *illiterate* brother, whose condition, however, he hastens to say, excites his profound sympathy! The thing is most ridiculous; but, in so far as it may be held to indicate the spirit in which university journals are conducted, it has its serious and lamentable side. A university sustained by public moneys should have as its one great object the rendering of service to the community as a whole. If it can only train a limited class, that class should look upon themselves as trustees for the whole people of the superior advantages their education confers upon them. Why should public money be spent in making A. B. a particularly intelligent and accomplished man, if he is going to put on fine intellectual airs, and even ask for special protection against the unlettered multitude? In this matter we have not yet got down to "hard pan," but we must get down to it. We are no advocates of a "misty socialism"; but we do not only advocate but demand the strict and scrupulous appropriation of public moneys to public purposes in the very widest sense of the term. To establish a system of intellectual caste is not a public purpose nor a social purpose, but an anti-social one. Let men who want to strut in intellectual broadcloth find their finery for themselves; but when a great educational institution has been established by the aid of public funds, let those who avail themselves of its advantages recognize that they are called to a ministry of public usefulness, and that it is theirs to see that, in some way, the toiling classes get a share of the benefits provided. Never shall we have a society worthy of the name, until those who have—whether in a material or an intellectual sense—are actuated by a sense of duty toward those who have not. When that day comes, we shall not hear it urged, as an argument for the retention of a difficult system of spelling, that it serves as a convenient mode of distinguishing the cultured from the uncultured classes. In that day, too, culture will probably mean something more than the ability to spell. It will be a thing of ideas and of real knowledge, a thing expansive by nature, and in the best sense of the word democratic. We should strongly advise the universities of to-day to prepare for the new culture of the future, and meantime to do their best to purge themselves thoroughly of that spirit of exclusiveness so plainly manifested in the passage quoted from "The Varsity," and of which it probably would not be difficult to gleam examples in other similar quarters.

LITERARY NOTICES.

JOHNS HOPKINS UNIVERSITY STUDIES FROM THE BIOLOGICAL LABORATORY. Edited by Professors NEWELL MARTIN and W. K. BROOKS. Vol. III. Baltimore, Md.: N. Murray, publisher.

WHEN a former volume of this publication was reviewed in these pages, we commended the intelligence and liberality of the trustees for recognizing the importance of supporting a scientific publication of so special a character as this one. It is an encouraging omen for science in this country, that universities are recognizing the importance of publishing the results of their laboratory-work. Aside from the honor which an institution derives from an issue of this nature, there is good reason to believe that such a publication is a proper investment for a library fund. Every college library needs upon its shelves the journals and transactions of home and foreign societies. Instead, then, of subscribing for many of these, it were better to invest the same amount in a publication which, by judicious exchange, accomplishes the same result, with the added satisfaction of contributing its scientific work to the world. The numbers before us maintain the high standard of the previous volumes. Space will permit hardly more than a mention by title. The volume commences with a memoir entitled "Significance of the Larval Skin of Decapods," by H. W. Conn. The author states that crustacea are a particularly favorable group for the study of phylogeny, and then proceeds to show the significance of the larval skin, and a very interesting discussion is given as to the ancestral form of crustacea. From his study of the larval cuticle in the long- and short-tailed decapods, the author infers that "all decapods are to be referred back to a form similar to the *protozoæ* (zoea), in which the segments of the thorax and probably of the abdomen were present, and whose antennæ were locomotive organs." Mr. Conn has another paper on the "Life History of Thalassema," a peculiar worm which lives within the empty shell of mellita or "sand dollar." He finds, among other interesting conditions, "the origin of the ova and spermatozoa as modified peritoneal cells, their growth in the body cavity, and their preservation in a sexually mature condition in sexual pouches. A segmentation of the embryo which is exceptionally among annelids perfectly regular, and the origin of the ventral nerve-cord from the ectoderm as a bilateral structure." Henry Leslie Osborn gives the results of his studies on the gill in some forms of prosobranchiate mollusca. Professor Lankester, in his valuable paper on mollusca, in the last edition of the "Encyclopædia Britannica," states his belief that the primitive gill of the mollusca was a *ctenidium*, a stalk with plates very much like the gill of Chiton and Fissurella. Mr. Osborn is led, however, from his embryological studies, to question this view, and to doubt whether the ctenidium form represents the primitive form of molluscan gill, and shows that in the *ctenobranchs* the gill is not a ctenidium, but a very much simpler organ. Its form compares closely with the primitive lamellibranchiate gill.

"Notes on the Composition of the Blood and Lymph of the Slider Terrapin," and also "On the Origin of the Fibrin formed in the Coagulation of Blood," by W. H. Howell. Both these memoirs are too technical for a short review.

"On the Action of Acid, Atropia, and Convallaria on the Heart; with some Observations on the Influence of Oxygenated and Non-Oxygenated Blood, and Blood in Various Degrees of Dilution," by H. G. Beyer. The title sufficiently indicates the scope of this paper, which will be more interesting to students of therapeutics, and to these and to physicians we commend it.

"The Action of Intermittent Pressure and of Defibrinated Blood upon the Blood-Vessels of the Frog and Terrapin," by Louis T. Stevens and Frederic S. Lee. This paper, like the last, is mentioned by title and for the same reason.

"Cranial Muscles of *Amia calva*, with a Consideration of the Relations of the Post-Occipital and Hypoglossal Nerves in the Various Vertebrate Groups," by J. Playfair McMurrich. His investigations lead him to believe that the primitive *Elasmobranchs*, the *Ganoids*, and the *Teleostei*, to be connected along one line, and the *Cyclostoma*, *Dipnoi*, and *Amphibia* along another.

"On the Endings of the Motor Nerves in the Voluntary Muscles of the Frog," by Chr.

Sihler, M. D. In this memoir is described a new method of demonstrating the nerve-endings in the muscles of the frog, as well as to bring forth evidence supporting the view that the terminal nerve-fibers are situated on the outside of the *sarcolemma*, and do not, as taught by most authorities, penetrate this envelope."

"Marine Larvæ and their Relation to Adults," by H. W. Conn, is an interesting memoir on the relations of various large groups of animals, based on the larval stages of these groups. Based on these relations solely, the author would place in the first group *Cœlenterata*, *Polyzoa*, and *Brachiopoda;* in another group the *Mollusks* and *Annelids*, and probably the *Planariane;* while a third group would contain *Echinoderms*, *Balanoglossus*, and probably the nemerteans and vertebrates. As the sponges and arthropods show no approach to the pilidium larva, they are not considered. Possibly this novel classification might be completed by uniting these in a fourth group! The volume closes with a paper by William Trelease, entitled "Observations on Several Zoögloeæ and Related Forms." This paper deals with bacteria, micrococcus, and related forms, with determinations of new species.

We may add that these papers are highly technical, and are accompanied with excellent plates.

NUMBERS APPLIED. A Complete Arithmetic. By ANDREW J. RICKOFF. New York: D. Appleton & Co. Pp. 416. Price, 75 cents.

THIS work has been prepared to meet the wide-spread and growing demand for a treatise on arithmetic adapted to the objective methods of instruction now common in schools. In its preparation the author has kept in view the thought that words are useless in the measure that they fail to call up in the mind vivid images of the things signified; and that, to the learner, the operations of arithmetic are apt to be only manipulations of figures after prescribed models, unless he realizes the fact that they are representatives of processes that may be applied to material objects. Hence the attempt has been made to vitalize the relation of words and things by the aid of the best practicable illustrations at every point; and to bring forward problems, or examples for solution, that should have life in them, or bear some relation to the affairs of every-day life. The work has been adapted, as far as possible, to the needs of those children who are liable to be withdrawn from school before a full course in arithmetic can be completed. Hence, the more useful business applications of elementary principles are made as soon as they are learned. Thus, familiar measures are introduced before reduction is mentioned; federal money before decimals; many practical measurements before mensuration; and questions even in percentage and interest are met with before those subjects are reached in due course. The conditions of these problems are so presented as to be within the easy understanding of the pupil, while their solution requires only such arithmetical operations as he has already learned. The authors also call attention to the simple treatment of the decimal system of notation and the variety of exercises under it; to the multiplicity of short exercises, while longer ones are not wanting; to the directions to the pupil, having in view the formation of right habits of computation; to the suggestions for original problems; to the simple and direct methods of treating the various subjects; and to the rigorous adherence to the inductive methods of instruction.

THE IRISH QUESTION. By the Right Hon. W. E. GLADSTONE. New York: Charles Scribner's Sons. Pp. 57. Price, 10 cents.

IN this pamphlet Mr. Gladstone explains and vindicates the position on the Irish question which he assumed and maintained while he continued in office as the working head of the British Government. The discussion is divided into two parts, with papers under the headings, "History of an Idea" (the Irish idea of home-rule), and "Lessons of the Election." The "Lessons" are for the Liberal party and for Ireland, and relate to the purchase and sale of land, and the conservatism of home-rule. In the conclusion, Ireland is advised to walk to the consummation of her wishes in the path of constitutional and peaceful action, and of steady, free, and full discussion, which has led England and Scotland to triumph.

THE LIFE OF ROBERT FULTON, AND THE HISTORY OF STEAM NAVIGATION. New York: G. W. Putnam's Sons. Pp. 507. Price, $1.75.

IN this book a great deal of information of an interesting character is packed into a moderate space; and the packing has been well done. Fulton's life is itself full of incident and adventure, illustrating the strong bent of his genius toward a particular line of experiment, and the persistency with which he kept his attention fixed on carrying the objects he had in view to a successful result. The materials for the life have been drawn from many sources, and his career as a whole is presented in an attractive light, and in its main features as an example of well-directed effort. The life of Fulton serves as an introduction, but an important one, to the history of steam navigation, which is very comprehensive. Beginning with Fulton's earliest experiments, as related in the "Life," it traces the history of the Hudson River steamboats, of steamboat navigation on the Mississippi and Ohio, the Great Lakes, Long Island Sound, English, and other foreign waters, from the earliest efforts of each down to the present time; relates the histories, severally, of the various great lines of steamers that have sailed or are now sailing on the ocean between the ports of the different continents, and closes with notices of war-steamers and ironclads. The illustrations represent numerous steamers and parts of steamers, beginning with Jonathan Hill's tow-boat in 1736, and ending with such vessels as the City of Peking, the Pilgrim, and the Alaska.

GENERAL BIOLOGY. By WILLIAM T. SEDGWICK, Ph. D., and EDMUND B. WILSON, Ph. D. Part I. Introductory. New York: Henry Holt & Co. Pp. 193.

THE authors of this book acknowledge that it owes its origin to the influence of Huxley and Martin, authors of the "Elementary Biology." Their aim has been, not to prepare an exhaustive treatise, but rather to lead beginners in biology from familiar facts to a better knowledge of how living things are built and how they act, such as may rightly take a place in general education, or may afford a basis for further studies in particular branches. "It is still an open question," they say, "whether the beginner should pursue the logical, but difficult course of working upward from the simple to the complex, or adopt the easier and more practical method of working downward from familiar higher forms. Every teacher of the subject knows how great are the practical difficulties besetting the novice, who, provided for the first time with a compound microscope, is confronted with yeast, protococcus, or amœba; and, on the other hand, how hard it is to sift out what is general and essential from the heterogeneous details of a mammal or flowering plant. In the hope of lessening the practical difficulties of the logical method, we venture to submit a course of preliminary study, which we have used for some time with our own classes, and have found practical and effective. Believing that biology should follow the example of physics and chemistry in discussing at the outset the fundamental properties of matter and energy, we have devoted the first four chapters to an elementary account of living matter and vital energy. In the six chapters which follow, these facts are applied to a fairly exhaustive study of a representative plant and animal, of considerable though not extreme complexity." The fern is selected as the plant, and the earth-worm as the animal. The last chapter comprises a brief account of the principles and outlines of classification as a guide in subsequent studies. From this the pupil may pass to other books, or to the second part of this one, which is to be published in the course of the following year.

THE MENORAH. A Monthly Magazine. Edited by BENJAMIN F. PEIXOTTO. Vol. I, No. 2. Pp. 48. Price, 25 cents; $2 a year.

"THE MENORAH" is the organ of the Order of the B'ne B'rith, which was established in 1843, to provide a bond of philanthropic and patriotic feeling among persons of the Hebrew race in the United States, and which has now more than four hundred lodges and nearly thirty thousand members. It contains a variety of literary articles, including a history of the order, to most of which a peculiar Jewish interest is attached; is divided into an English and a German part; and has departments devoted to Hebrew affairs at large, and to the order which

it represents. We learn from it that the Maimonides Library contains 26,840 volumes, the annual circulation of which is 47,570 among 4,708 readers. Of the additions of the past year only twenty-eight per cent were fiction. The librarian, Mr. Max Cohen, is collecting for it a body of works on political and social science; and efforts are making to secure an educational collection, for which books on the methods of instruction and administration of schools in this country and Europe have been acquired.

THE PHILOSOPHY OF EDUCATION. By JOHANN KARL FRIEDRICH ROSENKRANZ. Translated from the German by ANNA C. BRACKETT. Second edition, revised, with Commentary and Analysis. New York: D. Appleton & Co. Pp. 286. Price, $1.50.

THIS is the first volume of the "International Education Series," to be published by D. Appleton & Co., of which Dr. W. T. Harris is the editor. The original translation, which was made for the "Journal of Speculative Philosophy," was intended for the use of philosophical students, who in general admire precise technical terms. In preparing the present edition, the translation has been revised with a view better to adapt it to the needs of translators not skilled in philosophy. Where it has been thought necessary, phrases, or even entire sentences, have been used to convey the sense of a single word of the original; so that the editor is able to claim that no obscurity remains except such as is due to the philosophic depth and generality of the treatment, and that the translation is now more intelligible than the original. The peculiar merit of Rosenkranz's work is found in the fact that in it everything is brought to the test of the highest principle of philosophy; that one which is the acknowledged principle of Christian civilization, and which, as such, the author makes the foundation of his theory of education, while he demonstrates its validity by an appeal to psychology on the one hand, and to the history of civilization on the other; the principle of promoting the elevation of the human race. Among the points of great value, the author directs attention to the principle of self-estrangement as lying at the foundation of the philosophy of education, and as furnishing a key to many problems discussed by the educational reformers from Comenius to Herbert Spencer. The distinction of corrective and retributive punishment, the part of the work devoted to educational psychology, the methods of treating the three grades of capacity—the blockhead, the mediocre talent, and the genius—the care with which the subject of morality is treated, and the clearness with which the importance and functions of religious education are set forth, are particularly commended. An entire division of the book is taken up with a history of education, based on the philosophy of history. It is rather an outline of the history of human culture than a special history of schools or of pedagogics, and is recommended as highly valuable for teachers and parents, and for all who desire to see in a condensed form the essential outcome of human history.

TOPOGRAPHICAL DRAWING AND SKETCHING, INCLUDING APPLICATIONS OF PHOTOGRAPHY. By Lieutenant HENRY A. REED, U. S. Army. New York: John Wiley & Sons. Pp. 129, with Twenty-four Plates. Price, $3.50.

THE amount of literature which is devoted exclusively to the subject of topographical drawing and sketching, as distinguished from the actual field-practice, is very scarce. When the surveyor has completed the collecting of all the data which are necessary for the obtaining of an exact reproduction on paper of the area which has been surveyed, the question arises, Which are the best methods by which these data can be graphically reproduced in a map, so as to give the reader the best possible idea about the exact formation of the ground surveyed, whether it be a farm, a county, or a State? The progress made in topographical drawing has been very great, and although, of course, many conventional signs and colors have to be used, these are such that even unpracticed eyes may be able to read a map and to understand it in its minutest particulars.

Lieutenant Reed is Assistant Professor of Drawing at the West Point Military Academy. In his preface he states: "The writing of this book was first suggested by

the fact that there was no native work which fully treated of and illustrated rapid methods of hill-shading, and it is now written not only to explain these and other methods now used, either separately or in conjunction with them, but also to present the subject of topographical sketching in a form suited to a beginner."

The book is divided into two chief parts, topographical drawing and topographical sketching. The first is the exact reproduction, while the second is a more ready and quick, although not so exact, reproduction of the ground. The twenty-four plates form a very complete collection of all the instruments used by the surveyor and the draughtsman; they are very valuable, and contain, besides examples of work, conventional signs, hill-shading as executed on maps in this country and abroad, conventional tints, and projections for maps of large areas. The first nineteen plates are devoted to drawing, while the other five illustrate the instruments and methods used in sketching. Although sketching is not so exact and accurate as topographical drawing, it is, nevertheless, in many cases desirable to have the sketches as accurate as it is possible to obtain them. All the resources of modern science are called to help to assist in obtaining this desired result. Among these, photography also plays a not unimportant part.

It would be difficult to say whether the text has been written to explain the plates, or whether these have been made in order to illustrate the text. The two are so necessary to each other that they could not be separated.

Lieutenant Reed's work can not fail to recommend itself both to the beginner and to the veteran topographer. Even those whose special study is not in this line, will find it interesting in more than one respect.

FOURTEENTH REPORT OF THE COMMISSIONERS OF FISHERIES OF THE STATE OF NEW YORK. Albany: Weed, Parsons & Co. Pp. 209.

In accordance with the spirit of the legislative act under which the commission was instituted, hatching-stations have been established on the Hudson River for shad; at Caledonia, Livingston County, for the propagation, principally, of the trout kind—with a source of supply at Rochester for black bass, perch, pike, banded perch, and bull-head; at Cold Spring Harbor for anadromous fish, trout, and sea-fish; at Lake Brandon, Franklin County (Adirondack hatchery), for fish of the trout kind; and at Clayton, Jefferson County, for salmon, trout, white-fish, rainbow-trout, and perch-pike. The total production from 1870 to 1886, at the two stations in full operation (Caledonia and Cold Spring Harbor), was 102,549,624 of all kinds. The details of operations at the several stations, minutes of the proceedings of the Board of Commissioners, and the reports of game and fish protectors and protection societies, are given in the report.

THE AGE OF ELECTRICITY. FROM AMBER-SOUL TO TELEPHONE. By PARK BENJAMIN, Ph. D. New York: Charles Scribner's Sons. Price, $2.

THE chief wonders of the modern world are the marvelous applications of electricity which have recently appeared in quick succession. To those who would have an intelligent knowledge of what has been done in this field, and would understand, in some measure, how it has been arrived at, this book is addressed. It is a book to be read rather than one to be studied, although, in a work describing any of the peculiar manifestations of electricity there must be passages which require the reader's close attention, unless he is content to pass them by. Not many pages are needed for sketching the electrical discoveries made before 1820, of which the most important were galvanism, and Franklin's demonstration that electricity and the lightning are identical. The author then takes up the chief topics of his subject singly, describing, in successive chapters, the galvanic battery, the electro-magnet, the dynamo-electric machine, the electric light, electro-motors for land, water, and aërial use, electro-deposition of metals, and the storage-battery, the telegraph, including multiple and autographic telegraphy, the telephone, and the induction-coil, closing with a chapter on applications of electricity to the arts of war, railroading, medicine, dentistry, music, domestic economy, etc. In the chapter on the telephone, are described the microphone and the phonograph; also the instrument

which embodies the latest and most wonderful mode of transmitting messages—the photophone. The author has avoided technicalities, and has left out descriptions of complex instruments and operations which he deemed more likely to weary than to interest the reader. In dealing with the conflicting claims of rival inventors, he has endeavored to present the leading attainable facts without partisan bias. For the most part, historical data have been gathered from publications contemporary with the date of first production of the several discoveries and inventions, and, in many cases, from the original writings of the inventors and discoverers themselves. The text is illustrated with 143 figures, and the pages are freshened here and there by anecdotes and scientific poetry.

ELEMENTS OF GEODESY. By J. HOWARD GORE, B. S. New York: John Wiley & Sons. Pp. 282.

AMONG the exact sciences geodesy is the one most specially devoted to ascertaining what are the exact form and dimensions of the earth. In the book under review no new theories are advanced, none of the questions requiring solution are discussed. The author, who is Professor of Mathematics in the Columbian University, has endeavored to give in a concise and readable manner all that the student ought to be acquainted with. As he himself states in his preface: "The advanced student and practiced observer will find nothing new in this work." And also: "It is hoped that the beginner will be enabled to get a clear insight into the subject, and feel grateful that the discoveries and writings of many have been so condensed or elaborated as to make the study of geodesy pleasant."

The first chapter, which is an historic sketch of geodetic operations, is interesting and full of facts tending to show what progress has been made from the earliest times, and how the desire to know the real dimensions of the earth has kept man busy in devising and perfecting the methods of measurement. The progress made is given step by step, and, as no intricate mathematical questions are mentioned, this chapter can be read with profit by even those who are absolutely profane in mathematical studies.

Other chapters treat of instruments and methods of observation; base-measurements; field-work; the theory of the least squares; the calculations of the triangulation; formulæ for the computation of geodetic latitudes, longitudes, and azimuths; calculation of the figure of the earth. The dimensions obtained by some observers are given, as follows: Equatorial radius: Bessel (1841), 6,337,397·2 metres; Clarke (1866), 6,378,-206·4 metres; Coast Survey (1877), 6,378,-054·3 metres; Clarke (1880), 6,378,248·5 metres. Length of the quadrant: Bessel (1841), 10,000,856 metres; Clarke (1866), 10,001,888 metres; Clarke (1880), 10,001,-869 metres. Over twenty pages of formulas and factors are added at the close which will be useful for easy reference. Although this work is intended for students, practiced observers will find it a useful addition to their shelves.

HISTORY OF THE LAND QUESTION IN THE UNITED STATES. By SHOSUKE SATO. Baltimore: N. Murray. Pp. 181. Price, $1.

THIS volume constitutes three numbers of the Johns Hopkins University "Studies in Historical and Political Science." It was undertaken by the author in pursuance of special instructions from the Japanese Government to investigate certain questions of agrarian and economic interest in the United States. In the introduction are considered the general questions relating to the origin and importance of the public domain and to the principles of land-tenure. The story of the formation of the public domain is then told, its acquisition being the result of cessions by the States, the purchases of Louisiana and the Floridas, Texas annexation and Texas cession, the Mexican cessions, and the purchase of Alaska. Under the heading of "The Administration of the Public Domain" are related the histories of the Ordinance of 1787 and of the General Land-Office. Finally, the "History and Present Condition of the Land System of the United States" are surveyed in detail.

THE AMERICAN CITIZEN'S MANUAL. By WORTHINGTON C. FORD. Two volumes in one. New York: G. P. Putnam's Sons. Pp. 331. $1.25.

THE two books, or rather the two parts of the same book, here combined into one volume, have been before the public for sev-

eral years, and have been generally commended as carefully prepared and useful manuals of instruction in the rights and duties of citizenship. Their purpose is to answer the continually recurring question, What is the relation of the citizen of the United States to the governments under which he lives? The first step in giving the answer is to gain some knowledge of the machinery of government, its organization and manner of acting; together with the methods of choosing the agents of State action, and the more important points regarding official responsibility and the civil service. These subjects are treated of in the first part of the book, the original first volume. In the second part are considered the governmental duties of protection to life and property, the particular functions of the Federal and State governments, and questions of State finances.

HISTORY OF THE APPOINTING POWER OF THE PRESIDENT. By LUCY M. SALMON. New York: G. P. Putnam's Sons. Pp. 129. Price, $1.

THIS is one of the papers that were read at the meeting of the American Historical Association at Saratoga in September, 1885. It considers the subject of the appointing power of the President as presented in four periods: First, in the theoretical stage, 1787–1789, or the question in the Philadelphia Convention and the first Congress; second, in the period from 1789 to 1829, or, as exercised by statesmen, both Federalist and anti-Federalist; third, in the spoils period, 1829–1861, including President Jackson's interpretation of the Constitution and the results of that interpretation; and, fourth, in the reform period, including the culmination of the spoils system and the attempts to check the evil. In conclusion, though the last period has indeed been one of reform, though a practical civil-service bill has been passed, political assessments done away, and a temporary check given to the "courtesy of the Senate," yet after all it has been but an entering wedge. "The four years' limitation law is still on the statute-books; the Pendleton bill applies to only one seventh of our civil officers, and can be broken in spirit if not in letter; our consular service is still a refuge for those who desire to travel abroad at Government expense; foreign courts have rebuked our diplomatic system by refusing to accept representatives appointed for other reasons than that of fitness for place; 'offensive partisanship,' when other pretexts fail, can be made to cover a multitude of removals; in our State and local administrations scarcely an attempt at reform has been made. A fourth [fifth] period in the history of the appointing power is to come—a reformed period; when the chief Executive can boast like the great Premier that his sole patronage is the appointment of his private secretary; when every legislator can say, with a leading member of the House of Commons, that he is without power to influence in the smallest degree the appointment of a custom-house officer or an exciseman; when both Executive and Congress, freed from their duties of dispensing office, can turn their attention to more important questions of state; when our civil service will be in reality, and not in the idle jest of a politician, 'the best in the world.'"

FIRST STEPS IN SCIENTIFIC KNOWLEDGE. By PAUL BERT. Translation by Madame Paul Bert. Revised and corrected by WILLIAM H. GREENE, D. D. Philadelphia: J. B. Lippincott Company. Pp. about 400. Price, 60 cents.

THE author of this manual was one of the most eminent scientific men in France, and for some years filled the post of Minister of Public Instruction under the republic. If we recollect aright our reading of the French scientific journals of the time, he took particular delight in the preparation of the primers embodied in the volume, in simplifying science, and making it attractive to the children over whose educational interests he was engaged to watch. The "First Steps" are based on the principles of object-lessons. They are prepared so that they may be taught experimentally by skilled teachers, or with the aid of the objects themselves; or, if that is not convenient, abundant illustrations are furnished, through which the most important facts are exemplified by accurate pictures. The work is complete in seven parts, which are devoted respectively to animals, plants, stones and rocks, physics, chemistry, animal physiology, and vegetable physiology. The American editor has made only such changes and additions in Madame Bert's translation as

were necessary to Americanize the book, and adapt it to the requirements of public and private schools, as well as to home instruction in this country.

REPORT UPON THE THIRD INTERNATIONAL GEOGRAPHICAL CONGRESS AND EXHIBITION AT VENICE, ITALY, 1881. By Captain GEORGE M. WHEELER. Washington: Government Printing-Office. Pp. 586, with Eleven Maps and Plates.

THE report embraces an account of the proceedings of the Congress and a description of the Exhibition, in which the more important nations of the world showed the results of the best work that had been done in them in geography, topography, and cartography. More than this, it draws the lessons from those results of what may be of most benefit to the United States and to individual States. Of this character is the information it contains respecting the origin, functions, history, and progress of the several governmental topographic, hydrographic, and geologic surveys. The reports on Government land and marine surveys are full, and represent twenty-five countries. Under the head of works of reference are given copious bibliographies of English, French, German, Italian, Danish, and Spanish topographic surveys, Portuguese reports, and general geologic reports. The chapter on methods of reproduction (of maps), in which the various processes are described, is supplemented by plates giving specimens of the best maps executed in Switzerland, Germany, Spain, Saxony, Java, and France, illustrating as many methods of representation, each of which has its peculiar excellences. The author was a regularly appointed commissioner of the United States to the Congress and Exhibition, and had liberal facilities afforded him for collecting information. He hopes that what he has presented here may throw some light on the extent and object of the great land and water surveys of the world, and that it may form the basis of further researches in the direction outlined.

SECHRIST'S HAND-BOOK AND RAILWAY EQUIPMENT AND MILEAGE GUIDE MONTHLY. S. P. SECHRIST, Editor. Cleveland, Ohio: J. B. Savage. Pp. 190.

THIS publication is designed particularly for the use of operating railroad men. It contains tables of the passenger and freight equipment of all (American) railroads, giving numbers of cars, dimensions, capacity, etc.; works and equipment of all freight-lines and private car companies; official information showing to whom car-traces should be addressed, report of car-service made, and remittances for car-mileage sent; and other information of similar character; together with lists of railroad officers and offices, connections and junctions. It is the official guide of the Car-Accountants' Association of the United States and Canada.

BRACHIOPODA AND LAMELLIBRANCHIATA OF THE RARITAN CLAYS AND GREENSAND MARLS OF NEW JERSEY. By ROBERT P. WHITFIELD. Washington: Government Printing-Office. Pp. 269, with Thirty-five Plates.

THIS monograph was prepared for the Geological Survey of New Jersey, and is published in the series of the "Geological Survey of the United States." While the district from which the fossils described come is a limited one, it is one which, according to Professor George H. Cook, drew the attention of paleontologists earlier, and has been studied longer, "so that it is classic and typical ground for all American geologists." The boundaries of the district and its general features are carefully defined and described by Professor Cook in a preliminary note and in an accompanying map. Professor Cook also commends the author's work in bringing the fossils together and in revising and collecting imperfect descriptions, and in making new and better drawings; while the new species he has been able to add give completeness to the subject. Heretofore, many of these fossils which were described were not figured, and the descriptions were scattered in so many different works that they were practically inaccessible to most persons. Professor Whitfield has aimed to include in his report all the species of the two orders of the greensand marls and clays hitherto described and published, as well as several now made known for the first time. "It will be noticed," he observes, "that very few of the species have been recognized from localities outside of the State. It is certainly peculiar that so many local species

should have existed within the limits of New Jersey. This may, however, be attributed to certain causes which have existed over these areas during the deposition of these formations, and which would have produced a special fauna fitted for those conditions by eliminating from it all other forms not fitted to withstand them. Beyond this certain rapid or sudden changes seem to have taken place over nearly the entire coast of the State, at somewhat regular periods, which materially changed the conditions of life abruptly." The condition of preservation of the fossils, which are generally seen only as internal casts, also makes them hard to identify with perfect shells.

PROCEEDINGS OF THE AMERICAN SOCIETY FOR PSYCHICAL RESEARCH. Vol. I, No. 2. Boston: Cupples, Upham & Co.

THIS association appears to be making progress. The present number of its proceedings contains an interesting address from the president, Professor Simon Newcomb, of Washington, D. C., which discusses the subject of thought-transference with acumen indeed, but with only negative results; a report on the number-habit as bearing on thought-transference; a report of the committees on hypnotism, on mediumistic phenomena, and on thought-transference, with an appendix containing some experiments in the last-named field; a paper on the existence of a magnetic sense; a research on the reality of Reichenbach's flames; a preliminary report of the committee on apparitions and haunted houses, and a schedule of directions for investigation as to the alleged facts respecting the same. The society is now getting into good working order, and ought soon to give us something tangible as the fruit of its labors.

PUBLICATIONS RECEIVED.

Kedzie, R. C. Agricultural College of Michigan. Analysis of Commercial Fertilizers. Pp. 7.

Rigg, James, London. Catalogue of Apparatus for Technical Instruction, etc. Pp. 80.

Holden, Edward S. Photography the Servant of Astronomy. Pp. 12.

J. & J. Cash. Coventry, England, and New York. Harvard Commemoration Badge, satin.

Martin H. Newell, and Brooks, W. K. Studies from the Biological Laboratory of Johns Hopkins University. Vol. III. No. 8. Baltimore: N. Murray. Pp. 80, with Plates. $1 and $5 a volume.

Powter, N. B. Grand Caymans "Natural Phosphatic Guano." New York: Leaycraft & Co. Pp. 20.

James, Professor Joseph F., Oxford, O. Topography of Cincinnati. Pp. 6.

Union for the Improvement of the Canals of the State of New York. Proceedings of the Second Annual Convention. Pp. 15.

Wilder, Burt G. The Collocation of a Suture and Fissure in the Human Fœtus, pp. 6. Human Cerebral Fissures, etc., pp. 4. The Paroccipital Fissure, pp. 4. Notes on the Brain, and other Papers, pp. (in all) 7.

Hunter, Osborne, Jr., Washington, D. C. Labor *versus* Capital, etc. Pp. 32.

Ashby, Thomas A., M. D. On Operating during the Same Anæsthetization for Lacerations of the Cervix Uteri and Ruptured Peritonæum. Baltimore: Medical Journal. Pp. 10.

Becker, George F. The Washoe Rocks. Pp. 22.

Massachusetts State Agricultural Experiment Station. October Bulletin. Pp. 12.

Griswold, W. M. The Continuous Index. October and November, 1886. Pp. 1. 25 cents a year.

Williams, Chauncey P. Gold, Silver, and the Coinage of the Silver Dollar. Albany: Weed, Parsons & Co. Pp. 26.

Shufeldt, R. W. On an Old Portrait of Audubon, etc. Pp. 4, with Plate.

Crothers, T. D., M. D., Hartford, Conn. Certain Hereditary and Psychical Phenomena in Inebriety. Pp. 15.

Cornell University. Proceedings in Memory of Louis Agassiz, and in Honor of Hiram Sibley. 1885. Pp. 38.

Newberry, J. S. Earthquakes. Pp. 19.

Martin, Lillie J. Outline for Study in Chemical Botany, pp. 8. Plan for Laboratory Work in Chemical Botany, pp. 3. Preliminary Analysis of the Leaves of Juglans Nigra, pp. 7.

Brinton, Daniel G., M. D. Ikonomatic Writing. Pp. 14.

Dawson, Sir J. William. The Geological History of the North Atlantic. Montreal: Gazette Company. Pp. 50.

Rauch, John H., M. D., of Illinois. Address in State Medicine. Pp. 28.

American Institute of Electrical Engineers. Transactions. 1886. Pp. 163.

State Board of Health of Illinois. Eighth Annual Report. Springfield, Ill.: H. W. Rokker. Pp. 556. Medical Education and Medical Colleges in the United States and Canada. 1765–1886. Pp. 173.

P. Blakiston, Son & Co., Philadelphia. The Physician's Visiting List for 1887. Twenty-five patients weekly. $1.

Ives, Frederick E., Philadelphia. Isochromatic Photography with Chlorophyll. Pp. about 50, with Plates.

Peale, Albert C., M. D. Mineral Springs of the United States. Washington: Government Printing-Office. Pp. 225.

Raleigh, Thomas. Elementary Politics. London: Henry Frowde. Pp. 163. 25 cents.

Publishers' Weekly. Illustrated Christmas Number. 1886. Pp. about 200.

Mills, T. Wesley. Outlines of Lectures on Physiology. Montreal: W. Drysdale & Co. Pp. 200. $1.

Clifford, William Kingdon. Lectures and Essays. London and New York: Macmillan & Co. Pp. 441. $2.50.

Jukes-Browne, A. J. The Student's Hand-Book of Historical Geology. New York: Scribner & Welford. Pp. 597.

Colter, Buel P. An Elementary Course in Practical Zoölogy. Boston: D. C. Heath & Co. Pp. 189. 85 cents.

Mallock, W. H. The Old Order changes. New York: G. P. Putnam's Sons. Pp. 513. $1.

Randall, Rev. D. A. Ham-Mishkan, the Wonderful Tent. Cincinnati: Robert Clarke & Co. Pp. 430. $2.

Stephens, H. Morse. A History of the French Revolution. Vol. I. New York: Charles Scribner's Sons. Pp. 583. $2.50.

Tyrrell, Gerard G., M. D., Secretary, Sacramento, Cal. Ninth Biennial Report of the State Board of Health of California. Pp. 282.

Burnham, S. M. Precious Stones in Nature, Art, and Literature. Boston: Bradlee Whiddin. Pp. 400, with Plate. $3.50.

Stinde, Julius. The Buchholz Family. Translated by L. Dora Schmitz. New York: Charles Scribner's Sons. Pp. 262. $1.25.

Elliott, Henry W. Our Arctic Province, Alaska and the Seal Islands. New York: Charles Scribner's Sons. Pp. 465, with Plates and Maps. $4.50.

Moerlein, George. A Trip around the World. Cincinnati: M. & R. Burgheim. Pp. 205, with Colored Plates.

POPULAR MISCELLANY.

A Boy's Lesson in Taxidermy.—Mr. Frederick G. Mather, of Albany, communicates to us the following directions in regard to "The Best Mode of Stuffing Birds," which were found in an old portfolio, and which recall lessons that were given by one of the learning taxidermists in the country a generation ago. He has followed his boyish notes to the letter. *Materials.*—A glover's three-cornered needle; a knitting-needle sharpened and fixed in a handle, and a sharp knife; arsenical soap, prepared as follows: Pulverized arsenic, two pounds; potash, in powder, twelve ounces; camphor-gum, five ounces; white soap, two pounds; lime in powder, four ounces. Shave the soap into small pieces; place it in a pipkin over a slow fire, and add a little water; stir with a wooden spatula till the soap is dissolved; take it off and add potash, stirring till they are well mixed; add the lime by littles, and then the arsenic, stirring till all are internally mixed; when nearly cold add the camphor, dissolved in strong alcohol; if it becomes too thick, add water sufficient. Let the bird lie two to four hours before skinning. Don't squeeze the head. Swab out the throat with cotton and put in powdered plaster of Paris; then stuff cotton into the mouth, which presses the plaster into all the cavities of the head. Pass a thread or string through the nostrils and tie it; then stuff cotton into the nostrils. The use of the string will be seen hereafter. The cotton and plaster prevent any fluids from issuing out of the head and spoiling the skin. Having smoothed the feathers carefully with cotton, lay the bird upon a piece of thick pasteboard, or a thin board covered with canton flannel, soft side up. Place the bird upon this with the head toward the left hand. Separate the legs and feathers, and at the end of the breast-bone begin to cut through the skin, downward. If blood or other fluids issue, put in plaster of Paris, which will absorb them. Do left side in the same manner, cutting muscles and flesh from the body. Cut muscles of wings. The membrane of the ear must be undermined by a knife, and the knife forced upward, bringing out the ends nearest the bill. Gouge out the eyes. Clear away the brain, tongue, and muscles. Wash inside the skull with arsenical soap, and fill the skull full of powdered arsenic; then press a piece of cotton into the sockets. Leave the bones of the wing, and cut the muscles. Insert a thread at the other end of the bone in the skin. Break the knob off at the end of the wing-bone. Take the muscles out of the legs, and sometimes take the fat off the legs. Lubricate with arsenical soap, and wind the bone with cotton. Then take and tie the wings with their threads, not too tight. Lubricate the whole of it with arsenical soap. Get the ball of cotton out of the nostrils. Take a little awl, the size of a wire, and run it behind the toes to the joint; then straighten the legs and tie the bone to the wire. Take the cotton off and put more on with arsenical soap. Prepare a cork body of the length of the bird, and as large round as a large-sized bottle-cork. Then take three wires, two for the legs—which are already in the legs—and one for the neck. Join them to the cork body, leaving them to project three or four inches outside the real body. Wind cotton on the wire till it becomes as large as the neck, and lubricate with arsenical soap. Wind cotton around an instrument like a knitting-needle till it is about the size of your little finger, and take them off—as fast as made—and lay them on under and around the cork body. Press it from time to time, and put in arsenic-powder. Insert leg-wires. Don't get the legs too far back, or the breast too full. More arsenic. Begin at the upper part to sew up. Get

glover's three-cornered needles. Fix the tail nicely. Put a little aqua ammonia in the eye-sockets, and let it remain for an hour. Then clear away all sorts of matter and put putty in. Then take a glass eye and imbed it in the putty, not letting the latter show.

Scientific Novels.—These would serve a better purpose if the exigencies of plot and thrilling situation did not require the inculcation of so much pseudo-science. The student in college has to unlearn many things he learned at home from his Jules Verne. A lately published "Romance of Evolution"* is a striking example of the scientific misrepresentation needed to make what is known as a good story. The hero of this unique novel is evolved from ordinary mankind, as Maud S. was evolved from ordinary horse-kind, by artificial selection, and his wonderful development is supposed to have been achieved in seven generations. His development is not in certain directions at the expense of others—the usual result of artificial selection—but it is in *all directions* at one and the same time! In the short space of two hundred years the selected family advances from mediocrity, not in straight lines, but in an expanding circle, to the ideal of human perfection—the hero. He is a "demigod"—physically and intellectually, morally and spiritually. In this universal development are displayed, of course, the most incongruous combinations: savage valor, for instance, in overcoming single-handed a horde of mountain brigands armed with *rifles*, and "Christ-like goodness" in forgiving their chief, who has subjected him to long hours of torture; the rude simplicity of a wild man of the mountains and the æsthetic tastes of a Parisian. It was necessary to the plot that, though subjected to tortures which would have destroyed an ordinary man, the "demigod" should escape and immediately perform prodigies of prowess; hence the explanation is given: "That his skull was not fractured by the terrible blows it had received was due, under Providence, to the unequaled texture and elasticity of that helmet of Nature; that his cords and sinews were not broken or permanently injured, and his nervous system shattered, in the excruciating ordeal which followed, was because they were of Nature's best handiwork, compacted to endure the severest tests that mortality can sustain" (p. 294). How much longer could Maud S. endure blows of an axe upon her dainty forehead than a horse of humble pedigree? As a mere story, the book possesses a certain power and fascination; but as a contribtion to the literature of evolution, it is, like most scientific novels, a failure.

* "A Demigod." Harper & Brothers.

Balance among the Physical Functions.—Dr. H. C. Wood, of Philadelphia, maintains that, to make it possible to live to a good old age, the several vital organs must be approximately equal in strength. The man of ordinary physique, who possesses this fortunate balance of power, will in all probability outlive an athlete whose development has been unequal. Excessive strength in one part is, in fact, a source of danger. An over-developed muscular system invites dissolution, because it is a constant strain upon the less powerful organs, and finally wears them out. Death, in the majority of cases, is the result of local weakness. It often happens that a vital organ has been endowed with an original longevity less than that of the rest of the organism, and its failure to act brings death to other portions of the system, which in themselves possessed the capabilities of long life. The fact of having succeeded in life, with the satisfaction and comfort it brings, contributes to the prolongation of existence, while failure, with its resultant regrets, tends to shorten it. In old age, the organs possess less elasticity to meet and overcome such strains as can be invited with impunity in youth. Hence the old should be spared the strains. It is also desirable that, as their years advance, they should make their personal habits the subject of careful study, and, with the help of some wise counselor, regulate their daily life in accordance with the changed conditions of their animal economy. This is particularly the case with reference to diet.

Artificial Precious Stones.—The trade in artificial precious stones has become quite important, and the manufacture of them has reached a considerable degree of perfection.

The products of some of the shops would almost deceive an expert; but the test of hardness is still infallible. The beautiful "French paste," from which imitation diamonds are made, is a kind of glass with a mixture of oxide of lead. The more of the latter, the brighter the stone, but also the softer, and this is a serious defect. The imitation stones are now so perfectly made, and are so satisfactory to those who are not very particular, that their influence begins to be felt in the market for real stones. By careful selection of the ingredients and skill and attention in manipulation, the luster, color, fire, and water of the choicest stones are, to the eyes of laymen, fully reproduced. There are a few delicacies of color that can not be perfectly given, for they depend on some undiscoverable peculiarities of molecular arrangement and not on chemical composition, but the persons who are to buy the stones know nothing of that. Yet Sidot, a French chemist, has nearly reproduced these peculiarities, including the dichroism of the sapphire, with a composition of which the base is phosphate of lime. Two other French chemists, Fremy and Feil, have produced rubies and sapphires having the same composition with the genuine stones, and nearly equal hardness.

The Future of Political Economy.—Mr. John Biddulph Martin, president, said, in the British Association's section of Economic Science and Statistics, that we need not despair of the future of political economy because its teaching, based too often on *a priori* reasoning, and too little on the experience of history, does not always square with the judgments of men. May we not claim that political economy has rather taken up wider ground, than that it has abandoned many of its outworks? It is no reproach to economic science to have done so; to have recognized as matters within its proper scope considerations that the older economists, concerning themselves with wealth in its narrow sense, as the *summum bonum*, and with the desire for its acquisition as the one mainspring of human action, would have regarded as sentimental and philanthropic. Humanity is many-sided, its units do not lend themselves to grouping or combination with the precision of mathematical symbols, and the experiments of the social philosopher are subject to disturbances unknown in the laboratory of the chemist. It is at this point that the statistical method comes in as an inseparable ally of economic speculation. The speaker proceeded to a fuller review of the merits and faults of the statistical method, and then dwelt at considerable length on the tendency of men to accumulate in cities.

Australian Paradoxes.—In connection with the recent determination of the oviparous character of the monotremes, "Nature" republishes the following list of the paradoxes of Australia from a work published in 1832: "But this is New Holland, where it is summer with us when it is winter in Europe, and *vice versa*; where the barometer rises before bad weather, and falls before good; where the north is the hot wind, and the south the cold; where the humblest house is fitted up with cedar; where the fields are fenced with mahogany, and myrtle-trees are burned for fire-wood; where the swans are black and the eagles white; where the kangaroo, an animal between the squirrel and the deer, has five claws on its fore-paws and three talons on its hind-legs, like a bird, and yet hops on its tail; where the mole lays eggs, and has a duck's bill; where there is a bird with a broom in its mouth instead of a tongue; where there is a fish, one half belonging to the genus *Raja* and the other half to that of *Squalus*; where the pears are made of wood, with the stalk at the broader end; and where the cherry grows with the stone on the outside."

A New Incandescent Gas-light.—Mr. Conrad W. Cooke described, in the British Association, the Welsbach system of gas-lighting by incandescence. It consists in impregnating fabrics of cotton or other substances, made into the form of a cylindrical hood or mantle, with a compound liquid composed of solutions of zirconia and oxide of lanthanum (or with solutions of zirconia with oxides of lanthanum and yttrium). This mantle, under the influence of a gas-flame, is converted into a highly refractory material capable of withstanding the highest temperature that can be ob-

tained from the most efficient form of atmospheric burners. Under the influence of such temperatures it glows with a brilliant incandescence, very white and steady. The light emitted is, at a distance, hardly distinguishable from that of a twenty-candle incandescent lamp, while a yellower light may be obtained by modifying the composition of the impregnating liquid. A saving of from fifty to seventy-five per cent of gas is made with this light, and it is, moreover, smokeless.

The "Racket" of Society.—"The Spectator," discussing the "wear and tear" or "racket" of London society, observes that "wear and tear" implies not regular and natural use and tension of the powers, but a dragging in opposite directions, "such as is produced, for example, by the attempt to combine intellectual effort with a perfectly inconsistent amount of social effort; to carry off grave anxieties with a display of vivacity; to unite an unconstrained manner which implies a mind at ease with a concentration of effort implying a mind always vigilantly preparing for its next step." It means "the simultaneousness of a strain which is comparatively easy in cases of fully concentrated effort with that interchange of feeling which is natural only when there is no prior claim on the attention; the interference of social duties with professional duties; the *making* time for one thing, when all the time there is is really pre-engaged for another thing; the squeezing of gayety out of a preoccupied mind, or of severe but reluctant thought out of preoccupied feeling." This "tear" could be easily avoided by taking the natural precautions. "For nothing is easier than for the busy to claim and to insist on a certain amount of seclusion sufficient for the purposes of their work, if they would but recognize fairly that a great deal of what is called amusement doubles and trebles the tension of men's work." Regarding conversational intercourse with people, "A person of any mind will get more out of two or three conversations in a week or a month with the right people than he could get out of twenty or thirty." If people only realized how little pleasure their company can give when they are exhausted by the mechanical friction of the "racket" of society, they would, even from self-respect, forbear. The best evidence that persistent society-haunting is useless or mischievous is the relief with which those are received who have been long kept by any good reason out of the vortex of society, and return to the world with a little of the clearness of mind and confidence of view which the social racket saps and ultimately destroys. Social stimulants do the same kind of mischief that alcoholic stimulants do, though in a different region; and, "like an intoxicating drink, the racket of society becomes most indispensable to the very people whom it most seriously injures."

The Brocken and its Mist-Effects.—The Brocken is the culminating point of the Harz Mountains, and in its general form represents an oval slightly inclined from northwest to southeast. Its highest elevation is 1,141 metres above the sea. In consequence of its isolation in the midst of a lowland region, it is immediately exposed to the moist winds from the North Sea, and presents some very remarkable meteorological phenomena. The mean annual temperature at the top of the Brocken is about 36° C., and nearly the same as that of Tromsö in Norway, in 70° of latitude; but while Tromsö enjoys a summer in which potatoes and barley may be grown and fruits will fully ripen, no efforts to cultivate such plants on this range have succeeded. Clear days are rare on the Brocken, and the summit of the mountain is veiled by clouds nearly every morning; but the topmost peak may often be seen above the vapors which cover the slopes below; and it is not rare for the fogs to be so thick and so sharply defined that a man of the ordinary stature standing among them will have his head above the vapor while the lower part of his body is still densely involved. It is under such conditions as these that the "specter of the Brocken," a celebrated attraction to travelers, may be seen at the rising and setting of the sun, particularly in winter. The spectators view their silhouettes projected, in exaggerated proportions, upon the surface of the mist, which seems to rise like an immense curtain from out of the clouds. Their heads appear to be surrounded

with an aureole, while the shadows of other objects, notably of the tower of the inn, assume gigantic dimensions, all within the compass of a grand picture-frame defined by a rainbow. A similar phenomenon has been observed on the top of the Egischhorn, above the Aletsch glacier, in Switzerland. Another series of striking effects is produced in the Brocken by the excessive precipitation and deposition of moisture. Guests at the inn say that the telegraph-posts sometimes appear a yard thick under the accumulation of frost upon them, and the wires are frequently broken under the weight of the ice with which they become covered. The extremely fine drops of water, suddenly frozen, deposit themselves in crystalline figures upon everything against which the wind drives them. Under these effects Brocken landscapes take on a fantastic aspect in winter, which is heightened, when the sun is shining, by the reflections from the innumerable minute crystals.

Decrease of the English Death-Rate.—The English Registrar-General shows, from a review of the mortality of England during the ten years (1871–'80), that the mean annual death-rate has fallen to 21·27 per thousand, the lowest average since civil registration began. With this general fall is an increase in the death-rates in the later periods of life. This is also significant of improved tenure of life, for it shows that a larger proportion of persons live to be old enough to die in the later periods. Dr. Ogle gives the credit of the lessened death-rate among young people to improved sanitation, which has removed many fruitful sources of mortality, while by aiding the survival of weakly persons it may have had a tendency to increase the death-rate of the later periods. The changes in the death-rates, Dr. Ogle adds, "have given to the community an annual addition of 1,800,047 years of life shared among its members; and, allowing that the changes are the direct consequence of sanitary interference, we must regard this addition of nearly two million years of life as an annual income derived from money invested in sanitation."

Cardiac Overstrain.—The "Lancet" improves the occasion of the recent deaths of two persons by syncope after severe muscular exertion—one during an Alpine expedition, and the other after a sharp row on the river—to enforce the necessity of undergoing suitable preparation by training before engaging in unusual exercises. Both of the deceased persons, it says, "were of an age when degenerative changes in the muscular tissue of the heart or of the vessels would hardly be expected, and the syncope must have resulted from the sudden strain thrown on the cavities of a heart weakened previously by a long period of inactivity, and before the concordant action between the heart and great vessels had been established. This is always a danger when violent exercise is suddenly undertaken, and the mischief is of course greater in elderly persons than in young adults."

How Rice is Cleaned and Polished.—According to the reports transmitted by our consular officers from England and Germany, the processes for cleaning rice are quite complicated. The grain, after having been taken to the top story of the mill and blown and sieved, is divested of its paddy or husks by passing it over a sieve having a jumping action or tapping motion at the bottom, or by being carried between stones like those usually employed for grinding wheat. These stones, in England, are of a composition of magnesian calcinate and emery, and always keep a sharp face through the difference in hardness between the emery and the magnesian cement. Shelling-stones covered with cork have been tried and given up; and in Italy a surface of hard wood set on end is sometimes used, like the Burmese native hand-mills. In the process of shelling, a meal or flour is made from the crushing of the rice-paddy and the three pellicles which, inside of the paddy, inclose the grain, and is removed by apparatus adapted for the purpose. The husks are separated from the grain by a blast or exhaust, and the pellicles which still adhere to the grain by bruising in a mortar. The rice is then winnowed again, milled, rescreened, and polished, in polishers that generally consist of a sheep-skin-covered drum—the skin of a South Down is preferred, on account of the thickness of its wool—which revolves inside of a fixed wire casing about eighteen hundred to two thou-

sand feet per minute at the periphery. The form of apparatus mostly used is that of an inverted frustum of a cone. The general principle of its operation is that of a wooden cylinder revolving in a wooden mantle or mantle of wire-work, between which the rice has to circulate and be rubbed. Sometimes the rice, as it passes into the polisher, is subjected to an infusion of indigo toned down with rice-flour to a pale blue. This gives the rice a bluish tint, that is liked better in England than the natural creamy whiteness of the grain itself. On leaving the polishers, the grain is blown or aspirated, and separated into whole rice, broken rice, and rice of different sizes. A recent "improvement" is to pass the grain through an oiling-machine so as to give it a smoother and glossier surface.

The Volcanic Eruption in New Zealand.—The recent volcanic eruption which laid waste a large tract of country in New Zealand was one of the most remarkable that has taken place in civilized lands since the eruption of Mount Vesuvius in A. D. 79. It also presented many features in common with the Vesuvian eruption. Like that, it took place from a volcano which had never been known to exhibit activity since man had lived in the region; like it, it was distinguished by immense emissions of ashes and the burial of towns; and as the Vesuvian eruption numbered among its victims the naturalist Pliny, so in this one the young Englishman Brainard was overtaken while interested in observing the phenomena. The district afflicted by the eruption was becoming a favorite resort for tourists from all parts of the world on account of the remarkable phenomena and the beautiful aspects of scenery it presented, which in some respects resembled those of our Yellowstone wonderland. It is called the "Hot Lakes" district, and is situated about forty miles inland from the Bay of Plenty, on the east coast of the island. The lakes Rotorua and Rotomahana occupied its central portion, and were divided by fifteen or sixteen miles of "hot-spring country," in which numerous small columns of steam rise from bubbling pools of hot water. The ground around these springs is of the most treacherous character, is frequently broken up by the bursting out of new springs, and has been known to swallow up human beings passing over it. Nine miles from Rotomahana Lake rose Mount Tarawera, a curious truncated mountain two thousand feet high, whose summit was regarded by the natives with a peculiar veneration, and two adjacent peaks. On the borders of the lake were the "pink and white terraces," curved formations of sinter, of the color named, rising stairwise for about one hundred and fifty feet in height, with clear water running over them or standing in pools on their flats, the constant depositions from which added to their growth. The volcanic disturbances began on the night of the 9th of June, with a frightful earthquake-shock, followed by the burst of a glaring, pillar-shaped light from the top of Mount Tarawera, while over it hung a great black cloud. The scene was accompanied, according to the accounts, with loud reports, heavy shocks, tongues of flame, and the shooting of fire-balls. Then came a shower of ashes, mud, and stones over the township which buried the village of Wairoa under a deposit of from ten to twenty feet in thickness. About a hundred lives were lost, among them those of a part of the family of Mr. Haszard, the schoolmaster. The "pink and white terraces" were blown into the air, and the lake on whose borders they stood was ingulfed. Mud cones, vomiting forth steam and stones and mud, occupy their place. The aspect of the mountains was changed, and a large fissure was opened east of Mount Tarawera. As seen from New Plymouth, one hundred and fifty miles distant, the column of ashes rising into the air appeared to be about twenty-two thousand feet high. The noise of the explosion was heard at Christchurch, three hundred miles away; and vessels sailing one hundred and thirty miles away found the air thick with fine dust which settled on their decks. A hurricane arose about an hour after the explosion, blowing toward the scene of volcanic activity, and then in a few hours suddenly ceased, when ashes fell. The weather also became very cold. It is said that, about a fortnight before this disaster occurred, a wave three feet high suddenly arose on Lake Tarawera, at the foot of the mountain, and washed the boats out of the boat-houses.

Book-Worms and their Food.—The book-worm—that is, the larva that eats books and binding—is named, according to Mr. Sydney Klein, *Tenebrio mollitor*, and is a coleopter. It is attracted by the gluten in the paste used in binding the books; and Mr. Klein says that a dark flour—the "whole-wheat" flour—coming from America, and rich in gluten, is used largely for making paste and in the manufacture of cardboard. Hence the *tenebrio* is likely to find rich pastures in the books of to-day if he is admitted to them, and they are not "medicated." Light is thrown on this subject of medication by the observation of Mr. Russell Gubbins that the *tenebrios* have an apparent choice of colors. His *tenebrios* "had a decided preference for dark-colored paper," while "light-yellow paper, almost without exception, escaped." One of the papers that escaped was a light green—an arsenical paper. The light-yellow paper was probably colored with chrome-yellow, chromate of lead. So it appears that the insects may be fought by exercising judgment in coloring the papers which are to receive the paste.

Curious Central African Peoples.—The Rev. T. J. Comber, a Baptist missionary, has given to the Royal Geographical Society an account of his voyage, in company with the Rev. George Grenfell and in the missionary steamer Peace, up the Congo to the Bangala, and up the Bochini to the junction of the Kwango. The width of the river, from Stanley Pool to the Bochini, varies from twelve hundred yards to two miles. It is swift and strong, and navigation has to be performed carefully, on account of up-cropping feldspathic rocks An interesting feature of the first days' sails was the little clusters of huts on the sand-banks in twos, fours, and sixes, inhabited by Ba-Buma people, who sold beer and caught fish. The people are ruled by a queen, Nga Nkabe, whose husband, or "prince consort," Nchilo, "knows his place, and sits quietly by, smoking his pipe meekly and philosophically, while his wife rules." She is tall, brawny, and dignified, and about fifty years old, but "did not seem to think it beneath her to take her paddle, and, entering into a little canoe with another woman, to go herself to cut us a bunch of plantains." Her great desire was to possess a double-barreled gun, and she was evidently pleased with a present of cloths, a big bell, a soldier's great-coat, and some brass. The Ba-Buma were the best specimens of the African encountered on the journey. The women wear brass collars weighing from twenty-five to thirty pounds. The most primitive people seen by the travelers were the Ikelemba, about the great Ruki River, who go about with bow and arrow, or spears and shield, or a murderous sacrificial knife, wearing hats made of monkey-skins, of which the head of the animal comes to the front of their heads, while the tail hangs down behind. They are cruel, ingeniously cruel, and indulge among other amusements in chasing their human victims across the country as our hunters would chase a fox. Another exercise of their braves is inflicting "death by the knife," in which the head of the victim is so adjusted that, when it is cut off by a blow of a sickle-shaped knife, it is tossed by the spring of a sapling high into the air. In strange contrast with these revolting practices was "a pretty little performance by children, lasting several hours, and consisting, first, of clever dancing, and then of a little bit of operatic acting, after the style of a Greek play, the chorus part of which was very prettily rendered by little girls of eight to twelve years old. A strange-looking bier was carried in on the shoulders of four men. On the top of it was somebody or something covered over with red baize cloth. Sitting up at one end was a little girl looking sad and mournful. This bier (a native bamboo bed) was placed on the ground and surrounded by the 'chorus'—six little girls. A plaintive song was chanted by a woman who came to the side of the bier, which was chorused by the little girls. It was really pretty and effective; the idea of a drama in Central Africa surprised us altogether. We could understand but little of the words sung, but caught the frequent repetition at the end of the chorus of 'Ka-wa-ka' ('He is not dead'). After a time the spells of incantation were considered to have worked, and there was a noticeable heaving and shuddering in the covered mass at the girl's feet. The red cloth was drawn aside, and a girl was discovered, her chest heaving quickly and her

limbs trembling as if in a paroxysm of epilepsy. Two persons came forward, and, taking her by her arms, raised her to her feet. . . . The little performance was enacted to please the white man."

The Life-Term of Animals and Plants.—Dr. August Weissman regards the life-terms of animals and plants not as fixed and the results of internal processes, but as modifiable according to external conditions and the incidents of the struggle for existence. The idea that the immediate cause of death is the wearing away of the tissues does not agree with the theory that the tissues are undergoing constant changes of substance, resulting in alteration and restoration, nor with the fact that some kinds of cells go on reproducing themselves indefinitely, or with the other fact that some animals perish, when apparently in full vigor, immediately after performing the generative function. It would seemingly be better to look for the cause of death in the terminability of the reproductive powers; and we might explain the difference in the possible life-terms of different species by supposing that the number of cell-generations which can proceed from the egg-cells normally differs in each species. A perishable material is provided for the inevitable wear and destruction of the body, and the function of unlimited increase has been confined to a smaller number of cells, which we call reproductive cells. We have in this and in some other facts justification for supposing that the life-force is essentially and originally unlimited. This appears to be actually the case with some of the lower organisms. They may be killed in various ways, it is true; but, so long as the conditions essential to life are around them, they live, and bear within themselves the conditions of never-ending existence. The process of division by which ana mœba becomes two is sometimes spoken of as death and propagation, but there is no death in the case. Both parts equally live, and either might with equal right consider itself the mother and the other as the daughter body; and, if there be any transmission of consciousness and individuality, it is alike to both. We have no reason for supposing that either of the bodies will eventually die while the other lives; for, so far as our observation enables us to predict, both will go on dividing continuously without death taking place in any part. To account for the loss of the property of perpetual existence in the many-celled organisms, we may observe that a division of labor has been established among the cells as their structure has become more complex; and we have the life-supporting or somatic cells, and the reproductive cells, the former of which perform their several functions and cease to live, while the latter retain the faculty of continuous division or multiplication, and continue to live as the seed of offspring. They could not lose these properties without risking the extinction of the species. Death could not be introduced as a normal liability of one-celled organisms, because the two functions are united; but, in more complex organisms where there is a division of function, it is possible and exists. The normal vital term of the somatic cells appears to be contingent on the completion of the faculty of reproduction.

NOTES.

T. EGLESTON, in a paper on the causes of decay affecting building-stones, especially mentions such causes as depend on the removal of an ingredient by decay or decomposition. He observes that dolomitic limestones, which in some regions, in the case both of the native ledges and of monuments, crumble to sand, owe their disintegration to the fact that they are to a large extent mixtures of true dolomite and limestone; and that the limestone, the most soluble portion, is dissolved and removed by percolated carbonated waters.

A TUNNEL is projected, to be bored under Gray's Peak, in the Rocky Mountains. It will be placed 4,441 feet below the summit of the mountain, will be 25,000 feet long, and will give direct communication between the valleys in the Atlantic slope and those of the Pacific side, with a shortening of some three hundred miles in the transmontane distances.

DR. P. H. DUDLEY recently described to the American Institute of Mining Engineers two cast-iron car-wheels which a chemical examination had shown to be almost precisely the same in composition, but one of which was good, while the other was nearly worthless, for its purpose. From this, it appears that the value of articles of iron and steel is largely dependent on other conditions than

that of mere chemical composition. Mr. F. L. Garrison has found the microscope a very useful test for determining the qualities of metals, through the revelations which it affords of the arrangement of their particles and their structure.

The British Association's committee to observe the migration of birds has learned that birds on their arrival at the British Isles, as a rule, avoid high cliffs, and prefer to enter river-valleys, whence they spread gradually over the area embraced by the river's tributaries.

Mr. E. W. Bucke has determined by soundings the depth of the tubes of several geysers of the Rotorua district, New Zealand. In the case of the extinct geyser of Te Waro, he was let down the tube. At thirteen feet below the surface it opened into a chamber fifteen feet long, eight feet broad, and nine feet high, from one end of which another tube led downward to an undetermined depth. The author was satisfied, from his intercourse with the natives of the district, that by constant observations on the direction of the wind and the condition of the atmosphere, they had learned to prognosticate the movements in all these hot springs with wonderful accuracy. He had also observed during his residence that the geysers were in eruption only when the wind blew from a particular quarter.

Mr. Robert Capper proposed, in the British Association, a railway to connect the heart of Africa with London in ten days, as "a feat worthy of the age we live in." He would advocate the building of a railway from the two rivers Niger and Congo toward each other, and north and south at the rate of a mile a day, to form a spine through the continent. It would give the missionaries and traders two sides to work from, instead of one, as now.

Weeds are plants in the wrong place. They all probably have their right places and their uses somewhere in Nature's economy, though these are sometimes hard to appreciate. The most of them may serve to keep some desolate spot from being entiely bare, and the decay of their repeated generations furnishes mold to the ground, and may in time make it fit to bear something better. They all, too, have elements of beauty, and these will reveal themselves to every one who diligently searches for them. Many of them, if they were not weeds, would be prized as choice flowers, and some of them have been such.

Commenting on the vital statistics of one of the parishes of London, Dr. Meymott Tidy calls attention to the fact that the death-rate of England is decreasing, and that 150 people are added yearly to every 10,000 of the population. From this he prognosticates that at the present rate of increase the population of the country twenty generations hence will be 27,200,000,000, or enough, if distributed no more densely than the present population, to fill twenty earths. From 5,000,000 in the reign of Henry VIII, the population of England rose to about 7,500,000 in the early part of the reign of George III, and then, under the impulse of a long period of commercial prosperity, to 16,000,000 at the time of the repeal of the corn laws. Now, 24,000,000 people are housed and fed in England and Wales, and depend on other countries for half of their food. Dr. Tidy regards the present increasing population and declining trade as serious facts.

Dr. J. Burney Yeo mentions, as among the special applications which are made of the waters of the mineral springs of Continental Europe, the treatment of biliary obstructions and the plethoric forms of gout, at Carlsbad; of atonic gout, at Rogat; of calculous disorders, at Vichy and Contrexéville; of chronic articular rheumatism and gout, at Aix-les-Bains; of diabetes, at Neuenahr and Carlsbad; of obesity, at Marienbad; of gouty and catarrhal dyspepsia, at Hamburg and Kissingen; of anæmia, at Schwalbach and St. Moritz; of asthma, at Mont Dore; of throat affections, at Cauterets and Eaux-Bonnes; of scrofulous glandular affections, at Kreuznach; and of the great variety of chronic skin affections, at Aix-la-Chapelle, Cannstadt, La Bourbole, and Uriage.

Describing, in the British Association, his optical studies in the essential oils, Dr. Gladstone, after explaining how the refractive equivalent of an organic compound may be used to determine its constitution, pointed out that the dispersive equivalents can be similarly used. He also discussed the refraction and dispersion equivalents of the turpenes, citrenes, camphor, and some other members of the group of essential oils, and showed how their values are of service in determining the constitution of those bodies.

H. R. Mill has determined the salinity of the water from point to point in the Firth of Clyde and the Firth of Forth. The distribution of salinity in the Firth of Forth is constant all the year round, while periodical variations are observed through the whole mass of the water in the Firth of Clyde. It is evident that in the Forth River entrance, a mixture of river- and sea-water takes place by a true process of diffusion, and a constant gradient is maintained from river to sea. The dissolved matter of fresher water was found richer than sea-water in calcium carbonate.

THE "Revue Scientifique" claims the first thought of the germ theory of disease for a Dr. Goiffon, who died at Lyons more than one hundred and fifty years ago. He believed, in 1721, that diseases like the plague could be caused only by minute insects or worms, too small to be seen, perhaps, but nevertheless really existing. He also believed that the conveyance of infection could be explained by their activity and propagation.

AN observatory is in building at Sonnblick, in the Tyrolese Alps, ten thousand feet above the sea, which will be the highest of the kind in Europe. The mountain is relatively easy of access, with mines halfway up its slopes, and a wire rope-way in operation leading up to them. The observatory will be in telephonic communication with the mines, and thence in telegraphic communication with whatever spot it may be desirable to reach.

PROFESSOR ODLING has described a process in which benzoic acid, when heated in sealed tubes at about 260° with an aqueous solution of zinc chloride, is decomposed, and yields chiefly benzene, together with a small quantity of diphenyle.

OBITUARY NOTES.

MR. ELI WHITNEY BLAKE, the inventor of the Blake stone-crusher, who recently died at his home in New Haven, Connecticut, was the founder of the Connecticut Academy of Arts and Sciences, and for several years its president. He communicated several papers to the "American Journal of Science" and other scientific publications; and a number of these were published together in 1882, under the title of "Original Solutions of several Problems in Aërodynamics." His stone-crusher is in nearly universal use.

PROFESSOR H. A. BAYNE, Ph.D., of the Royal Military College, Kingston, Ontario, has recently died. He was a student under Liebig, Bunsen, and Dumas.

HERRMANN ABICH, an eminent Austrian geologist, died on the 1st of July, nearly seventy years of age. He began his scientific career in 1831 by the publication of a memoir on the minerals of the Spinel family. At a later period he devoted special attention to the phenomena of volcanic action; he published an atlas of views of Vesuvius and Etna in 1837, and a work on volcanic formations in 1841. He investigated the Caucasus region and Southeastern Europe, and was, at the time of his death, superintending the publication of the "Geologische Forschungen in den kaukasischen Ländern," his greatest work.

THE death is reported of M. Ernest Desjardins, professor in the Collége de France, aged eighty-three years. His principal labors were upon problems of comparative geography, in which missions executed by him in Egypt, Italy, and the basin of the Danube, led to interesting discoveries. His most important publications were on the topography of Latium, the ancient geography of Italy, and the geography of ancient Gaul.

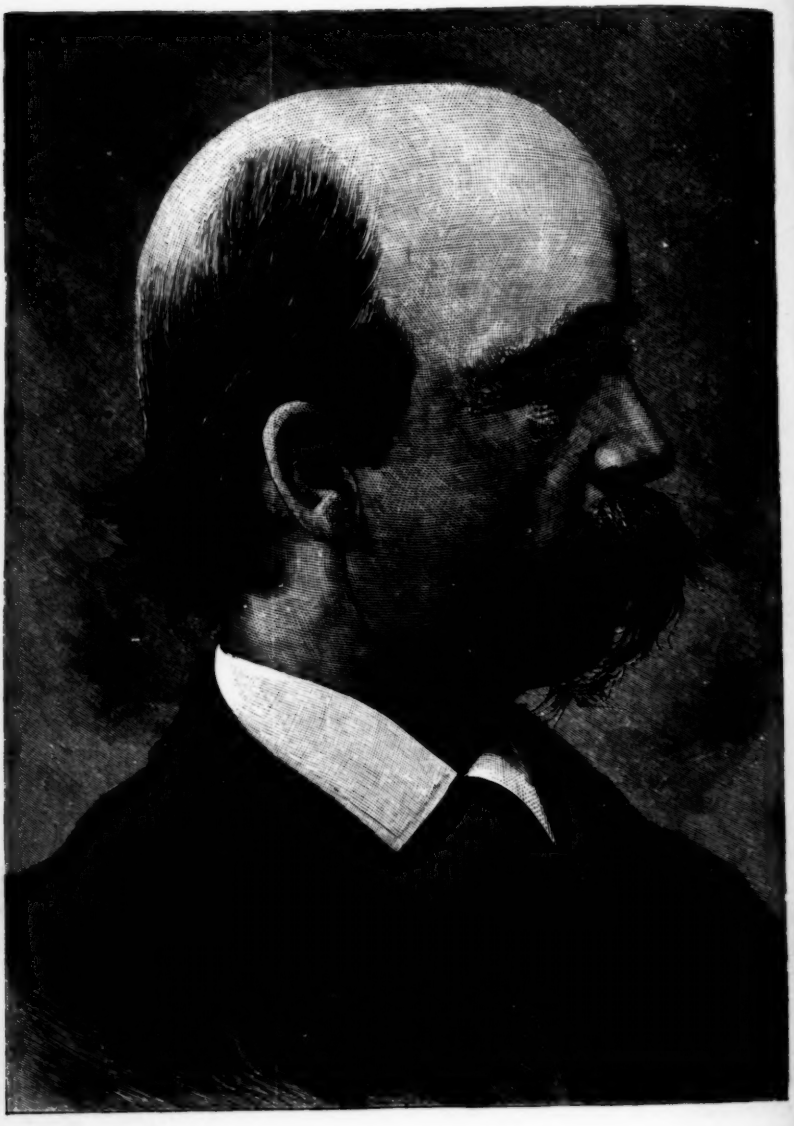
ALESSANDRO DORNA, Director of the Astronomical Observatory at Turin, died in August last, aged sixty-one years.

M. PAUL BERT, the eminent French physiologist, died in Tonquin, where he occupied the position of French resident in Annam and Cochin-China, on the 11th of November. He had held professorships at Bordeaux and Paris; was elected to the National Assembly in 1874; was an efficient Minister of Public Instruction in Gambetta's Cabinet; and was a pleasing writer on scientific and educational subjects.

PROFESSOR FREDERICK SETTLE BARFF, inventor of the Barff process for preventing the corrosion of iron and of an antiseptic compound, died on the 11th of August, aged sixty-two years. The record of his life is one of useful investigation and invention. He delivered at different times "Cantor Lectures" of the Society of Arts on "Artistic Colors and Pigments," "Silicates, Silicides, Glass, and Glass-Painting," and "Carbon, and Certain Compounds of Carbon, treated principally in reference to Heating and Illuminating Purposes"; also juvenile lectures, for 1878, on "Coal and its Compounds." He was awarded the Society's medal for a paper on "Zinc-White as Paint, and the Treatment of Iron for the Prevention of Corrosion," and a second medal for his paper on "A New Antiseptic Compound." He held the positions of Assistant Professor of Chemistry at University College, London, Examiner in Chemistry for the Natural Science Tripos, Cambridge, and Professor of Chemistry at the Catholic University at Kensington, and in the Jesuits' College, Beaumont.

DR. JOHN P. GRAY, Superintendent of the New York Lunatic Asylum, died in Utica, November 29th, of Bright's disease, aged sixty-one years. After having been assistant physician at the lunatic asylum for several years, he was appointed its superintendent in 1854. He was regarded as one of the foremost experts in insanity in the United States.

PROFESSOR PANUM, the great Danish physiologist, has recently died in Copenhagen, in the sixty-fifth year of his age.



CHARLES C. ABBOTT.